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Improved Cotton Press.

Our engraving represents a cotton press constructed upon a new principle, for which are claimed several advantages over presses hitherto constructed. The nature of the advantages claimed will better appear after a glance at the details and operation of the press.

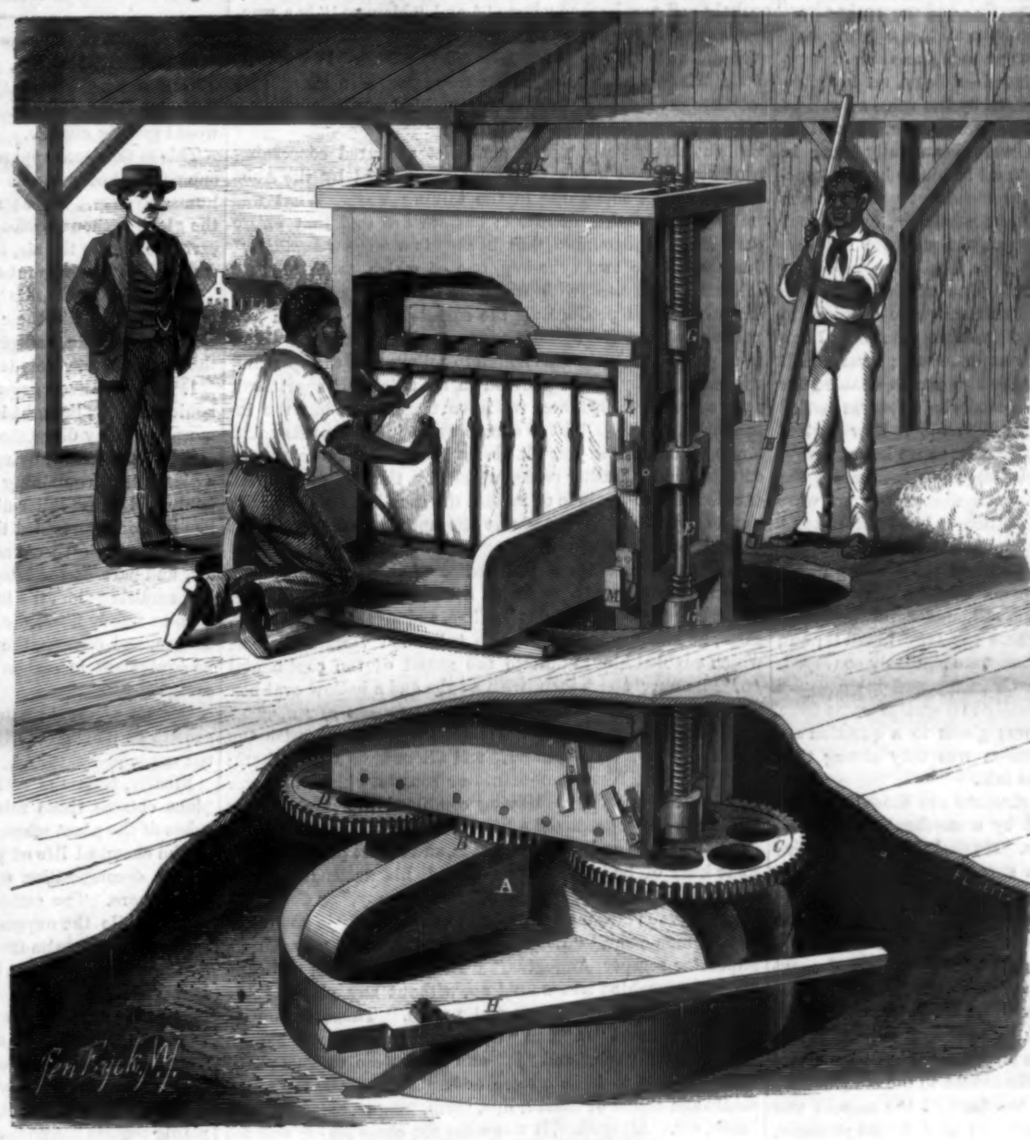
A, in the engraving, Fig. 1, is a pedestal having a central pivot, upon which the entire superstructure turns during the compression of the bales. Fixed firmly to the pedestal is the toothed wheel, B, which gears into both the toothed wheels, C and D. The latter wheels are keyed to upright screw shafts, E and F, each shaft having two screw threads—one a right-hand thread and one a left hand thread.

These screws run in nuts, G, attached to the followers, of which there are two, one above and one below the bale. The upper follower descends and the lower one ascends simultaneously, leaving the bale, when pressed, in the position shown in Fig. 1.

The screws are worked by inserting the levers, H, into the space between angular lugs, I, and the side wall of the press, and by their aid turning the entire press, with its contents, about the central pivot. The toothed wheel, B, being fixed, the turning of the press causes the wheels, C and D, to turn with their screw shafts, and run down the upper follower and run up the lower one, to compress the cotton. Reversing the motion runs these followers back to their first position—the position of the upper one when run up being shown in Fig. 2. Angular metal straps, J, Fig. 2, then receive the ends of the levers, H, which are then hinged at K, the counterpart of the hinges being upon the levers themselves. The depression of the outer ends of the levers opens the follower like a lid on its hinges, and *vice versa*.

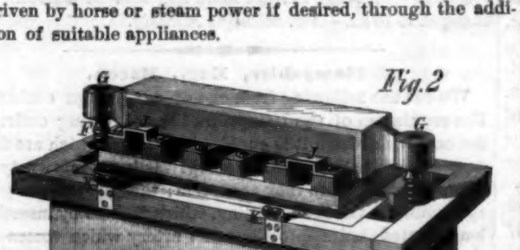
The bale, when pressed, is taken out of a door in the side of the press, as shown in Fig. 1. The door, when closed, is held together by a strong bar, engaging with lugs, L, and another strong bar pivotedor hinged at M.

The advantages claimed for this press are, that the use of two screws always keeps the bale of uniform size at both ends, that the double screws and arrangement of gearing give great strength to the press, and rapidity in pressing, that the press can be afforded at a cheap rate, that it possesses no complications liable to get out of repair, and that it is adapted to be driven by horse or steam power if desired, through the addition of suitable appliances.



BOOTON'S COTTON PRESS

Fig. 2



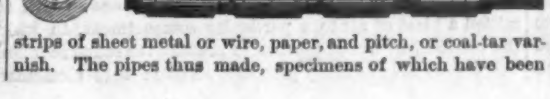
Patented, through the Scientific American Patent Agency, Oct. 18, 1870, by Sinclair Booton, whom address for further information, care T. D. Johnston, San Antonio, Texas.

Boring Machines at the Mont Cenis Tunnel.

Prof. Ansted says that it is a curious and instructive sight to see a workman connect an elastic tube of about half an inch diameter with one of these machines, and watch the result when a small tap is turned. A piston-rod, working in an exceedingly small and short cylinder, immediately files backwards and forwards with wonderful rapidity, regulated by a small but rather heavy fly-wheel. Immediately a ponderous chisel, 6 or 7 feet long and more than an inch in diameter, is set in motion, and, having been previously placed in position, strikes a succession of heavy blows against the stone. Fragments begin to fly in all directions. Each time that the chisel strikes it is withdrawn a little way, very slightly turned, and immediately strikes again in the same hole. The stone experimented upon being of the hardest and toughest kind, the effect is not seen for several strokes; but within two minutes, during which the writer watched the experiment, a steel chisel was completely blunted and rendered useless, and there was a hole made about two inches deep in the mass of quartzite placed to operate upon. It is evident that nothing can resist such an attack; and, indeed, holes are bored in this way in an hour that would formerly have taken a day. The machines occupy very little space, and are by no means cumbrous. They can very easily be moved when and where they are needed. As many as seventeen are at work together in the end of the tunnel where the advance is being made. As the power is compressed air, they not only add no heat to the interior, but render it cooler by the absorption of heat during expansion. The air, when it escapes, is available for ventilation. It would be quite impossible to carry steam at a high pressure through pipes four miles long, but little diminution of force is experienced in working with the air, although all the engines and condensers, as well as the cylinders for storing the air, are outside the mouth of the tunnel. The length of pipe at present on the Piedmont side is about four and one fourth miles. The pressure of air commonly employed is about six and a half atmospheres, or nearly 100 lbs. on the square inch.

STOW'S NON-CORRODING WATER AND GAS PIPE.

Our engraving, which accompanies this article, illustrates a new water and gas pipe, in which the materials are coiled



strips of sheet metal or wire, paper, and pitch, or coal-tar varnish. The pipes thus made, specimens of which have been submitted to us, seem strong, and they are not only much lighter than metal pipes designed to sustain the same pressure, but are totally free from objection in a sanitary point of view.

The pipes are made by coiling around a mandrel, C, a strip of pitched paper, D. Outside of the paper coil is then wound the sheet metal or wire coil, E, which is cemented to pitched-paper coil. If wire is used pitched paper is interposed between the layers.

The partially formed pipe is then covered with single or double roofing pitched paper, and the inside thoroughly coated with hot pitch or coal-tar varnish, which fills all the interstices and gives a smooth interior surface, preventing any contact of water with the metal, and consequent oxidation.

It is claimed that the compound material of which the pipe is mainly composed, being a very slow conductor, the water in the pipe is protected from the effects of frost. For very cold climates or exposed situations the thickness of the outer coating of paper and pitch may be increased to any desired degree, to render the protection from frost perfect; or a coating of pitch and sawdust may be added to increase the thickness. We are informed that it has been proved by experiment, that a pipe of this kind, of three fourths inch caliber, and five sixteenths of an inch thick, will withstand a pressure of five hundred pounds to the square inch. The strength of the pipe may be increased indefinitely by applying more spiral strips of metal, interposing pitched paper between them.

It is further claimed that these pipes are cheaper, stronger, and more durable, than metal pipes, and that they are not affected by acids generally found in water.

For gas mains the pipes are coated on the inside with an acid proof composition. The pipes can be made of any required size, for gas or water mains.

For right to manufacture, address the patentee, Henry M. Stow, New York city.

WASHING SHIELD.

In the rubbing of clothes by the hands, the skin is liable to be abraded from the mechanical action, which is greatl aided by the softening of the skin from the effect of the free alkali in the soap employed. To protect the hands from this abrasion the device shown in our engraving has been invented. It was patented by C. F. Lewis, of Washington, D. C., February 5, 1867.

The device consists in a corrugated shield or armor, which protects the person and forms an effective surface for rubbing the clothes.

THE Chesapeake Bay oysters, which last February were transferred to the Pacific coast, and planted in the Bay of San Francisco, have increased to a wonderful size, and, as the journals of San Francisco assert, are much superior in flavor, grow more rapidly, and thrive better than the oysters in the beds on the Atlantic coast.

TALKING MACHINES.

[Condensed from All the Year Round.]

A distinction between the honest and the deceptive in such contrivances deserves to be noted. There have been some so-called talking and singing machines, in which the talking and singing really came from human lips, under such circumstances as led the audience to believe that mechanism produced the sounds. We know very little about Roger Bacon's speaking head; but there is reason to believe that, if the machine were ever produced at all, the sounds emitted came from human lips. A famous exhibition, called the "Invisible Girl," was a deception in which much ingenuity was displayed. In this machine there was a girl or lady concerned, who did the talking and singing, and who was invisible to the audience; the deception consisted in leading the visitors to suppose that she was in a small globe suspended in mid-air. There were four upright posts, united at top by four horizontal rails, like the framework of a table. Bent wires, springing up from the posts, converged to an ornamental center; and from these wires were suspended a hollow copper ball, with four trumpet mouths on four sides. This was all the visitors saw. Any person wishing to propose a question, spoke it into one of the trumpet mouths; and presently afterwards an appropriate answer came from all the four mouths. The voice was so soft that it seemed to come from a very young and diminutive being indeed—a fairy, an invisible girl. French and Italian were spoken by the voice as well as English; witty and lively remarks were made, as well as questions answered; and songs were beautifully sung in silvery tones. It was admitted on all hands to be an attractive exhibition; and as there were means of verifying the fact that the globe touched nothing whatever, except four ribbons by which it was suspended, the surprise felt was great.

The facts of the case were these. One of the posts was hollow, as were two of the rails; and there were openings in the rails just opposite two of the trumpet mouths. In an adjoining room was a lady seated at a pianoforte; a very small opening in the partition between the two rooms enabled her to see what was going on; while a concealed tube was carried from a point near the level of her ear to the hollow part of the machine, beneath the floor. Sounds, as we know, travel very easily through tubes; and thus the questioning, the answering, the singing, and the pianoforte playing, were transferred from room to room. When a spectator asked a question speaking at one of the trumpet mouths, the sound was reflected from the trumpet back to the opening in the horizontal rail, which opening was neither seen nor suspected by the audience; it went down the rail, under the floor, and into the adjoining apartment, where the lady heard it; and the sounds in the opposite direction were similarly conveyed. The sound became so altered in character and intensity by this process of transmission as really to seem to come from the ball; and when an answer was given to a question expressed in a whisper, the impression was very strong that the answers really came from the ball.

But the more interesting contrivances are those in which the sounds are really produced by a mechanism of pipes, bellows, keys, vibrating reed, etc. Musical instruments have in some cases been played with surprising success by such means, involving the expenditure of an almost incredible amount of time, patience, and ingenuity in devising the requisite arrangements. Vaucanson's flute player was a wonderful example of this kind. It was a life-size figure, dressed in the ordinary fashion of his day (about 1730), and standing on a pedestal; both figure and pedestal being full of delicate machinery, essential to the working of the machine. When wound up with a key, the figure played real music on a real flute. Air was projected from the mouth to the embouchure or mouth-hole of the flute; and the force of the current was varied to suit the loudness or softness of different passages, as well as the different pitch of their octaves, the opening between the lips being varied to assist in producing the desired effects. The fingers, made of some elastic material, stopped the holes in the proper order for producing the several notes. The machine was constructed to play a certain number of tunes, beyond which its powers did not extend. Soon afterwards the same clever mechanician produced his automaton flageolet-player. The flageolet had only three holes; and so diverse was the intensity of wind required to produce all the notes of a tune with such limited means, that the pressure varied from one ounce for the lowest note up to fifty-six pounds for the highest. Another of his productions was his automaton pipe and tambour player; the figure of a shepherd, standing on a pedestal, played nearly twenty minuets and country dances on a shepherd's pipe held in the left hand, at the same time playing on a tambour (a kind of hybrid between a tambourine and a small drum) with a stick held in the right hand.

Maelzel's automaton trumpeter, exhibited about sixty years ago, was quite a triumph of ingenuity. A figure, dressed in the uniform of a trumpeter of Austrian dragoons, when wound up by a key, played the Austrian Cavalry March, and a march and allegro by Weigl, on a trumpet, and was accompanied by an orchestra, the sounds of the trumpet being admirably produced. Then, his dress being changed to that of a French trumpeter of the Guard, the figure played the French Cavalry March, all the signals, a march by Dussek, and an allegro by Pleyel. When we consider the numerous modifications of pressure with which the lips of a trumpeter touch the small end of the trumpet, the production of such results by machinery is certainly surprising. Soon after Maelzel's time, Maillardet produced an automaton pianoforte player. The figure of a lady, seated at a pianoforte, played no less than eighteen tunes, keeping on for an hour when once wound up; the machinery was laid open at intervals in such a way as to show that it was really mechanism that played. The white keys or natural notes were pressed with the fingers in the usual way, but the flats and sharps were produced by pressing on pedals with the feet. The inventor succeeded in making this lady more graceful in her attitude and movements than is generally the case with automata. Somewhere about 1820 there was an exhibition of two automaton flute-players in London; the two figures played eighteen duets, which must have required a vast amount of interior mechanism.

Another class of these ingenious contrivances comprises pieces of mechanism, which imitate the cry of certain animals and the song of birds. This has been rather a favorite problem with clockmakers, and there are many famous clocks of this kind.

The machines which, with more or less success, imitate human speech, are the most difficult to construct, so many are the agencies engaged in uttering even a single word—lungs, larynx, tongue, palate, teeth, lips—so many are the inflections and variations of tone and articulation, that the mechanician finds his ingenuity taxed to the uttermost to imitate them. The speaking doll, which gives forth its melancholy and woe-begone "Papa!" and "Mamma!" is a wonderment to all the little folks, who regret very earnestly that such dolls are too expensive to be freely purchased; but it is, nevertheless, a poor affair, albeit there has been much care and thought bestowed in devising the kind of vibrating reed to be used.

About ninety years ago, a pamphlet appeared concerning two large brazen heads that were constructed by the Abbé Mical, to effect something in the talking way. What was really done is rather doubtful; but we are told that entire phrases were pronounced, that the sounds were *"sur-humaine;"* that there were two cylinders, one of which could produce determinate phrases, with proper intervals and prosody, while the other could produce all the sounds of the French language, analyzed and reduced to the smallest number. There were people uncharitable enough to believe that the speaking was managed by a living person in an adjoining apartment, as in some other instances we have mentioned; but the information was too slight to enable us to judge on this point. Kratzenstein, a few years later, made experiments on a series of tubes and vibrating reeds, which, by the aid of bellows, enabled him to produce or imitate the sounds of the vowels; but he appears to have made no attempt with the much more difficult sounds of consonants.

Wolfgang von Kempelen, inventor of the far-famed automaton chess player, constructed a talking figure which cost him a large amount of thought, time, and inventive ingenuity. First, he made experiments with tubes and vibrating reeds, which enabled him to imitate the sound of the continental "a," like our "ah;" then, with a tube and a hollow oval box hinged like the jaws, he produced the sounds of "a," "o," "ou," and an imperfect "e;" then he succeeded with the consonants "p," "m," and "l," and afterwards a few others; but there were some consonants or sounds which he never succeeded in imitating. Having combined the results of his researches, he constructed a head which contained the requisite wind tubes and vibrating reeds, and a bust provided with some kind of bellows. Thus armed, his automaton could pronounce the words "opera," "astronomy," "Constantinople," "vous êtes mon amie," "je vous amie," "je vous aime de tout mon cœur," "Leopoldus secundus," and "Romanum imperator semper Augustus." These words were spoken when the machine was wound up, without any player being required to press upon keys and pedals. Tubes to imitate nostrils produced "m" and "n;" a funnel and a reed changed "s" into "z," "sch," and "j;" and there were various pieces of mechanism to imitate more or less successfully the movements and action of mouth, lips, teeth, tongue, palate, glottis, lungs, etc. Altogether, it was what the chess-player was not—really an automaton.

Professor Willis and Sir Charles Wheatstone some years ago devoted a good deal of attention to this matter; not, of course, for any exhibition purposes, but to analyze the production of vocal sounds in a scientific way. Sir Charles showed the results of his experiments at one of the meetings of the British Association. Professor Willis separated all the sounds, whether letters or exclamations, emitted in speaking, into three groups, which he called mutes, sonants and narisonants. Leaving consonants untried, he made experiments in the mode of producing vowel sounds by mechanism. With an air chest, vibrating reeds, and cavities and tubes of different kinds, he produced a great variety of sounds. One curious result of his experiments was, that with the same apparatus, drawn out gradually in length, he could produce in succession all the vowel sounds which are heard in such English words as "see," "pet," "pay," "past," "pan," "caught," "no," "but," "book," "boot;" we find, in effect, that the lips protrude more and more as this series advances; and this supplies a noteworthy confirmation of the views held on this matter by the experimenter.

Some of the readers of this article may perhaps remember Professor Faber's automaton-speaking figure, called the "Euphonia," when exhibited in London. It was a draped bust with a wax face. Concealed from the visitors were sixteen keys or levers, a small pair of bellows, and numerous little bits of metal, wood and india-rubber. When any word or sentence was spoken out, either by Faber or by one of the audience, the exhibitor mentally divided all the syllables into as many distinct sounds as they embodied; he pressed upon a particular key for each particular sound, which admitted a blast of air to a particular compartment, in which the mechanism was of the kind to produce the sound required; there were thus as many pressures as there were elementary sounds. By a modification of the movements, whispering could be produced instead of speaking.

This machine has been improved by the nephew of Herr Faber, and has recently been exhibited in London. One good point about it is that every part of the mechanism is laid fairly open to visitors. True, a wax head or mask is used, through the lips of which the produced sounds are really emitted; but this mask is at intervals removed, to show the movements of india-rubber lips and tongue belonging to the machine itself. The elementary sounds, by further analysis, have been brought down to fourteen, all others having been found to be really compound sounds, made up of two or more elements. A lady, seated at a kind of key-board, has fourteen keys or short levers before her; a sentence is given out, in any one of two or three languages; the lady instantly analyzes the sounds, and decides which of the keys will produce each, or which combination will produce the whole of them; she then plays, somewhat in the manner of harmonia-playing, giving the proper number of pressures on the properly selected keys. Some sounds are difficult to imitate, some are imitated readily; a laugh is capitally given, and a cry is sufficiently doleful for all required purposes; a whisper and a sigh are also producible.

What Becomes of Carbonic Acid?

Animal life, and fire, diminish the amount of oxygen in the atmosphere, while increasing the amount of carbonic acid. Hence, in the lapse of time, the present conditions for life would greatly change.

This is the more apparent, since air containing as much as one per cent of carbonic acid acts already deleterious on the human system. But as animal life has existed for ages on the globe without producing any dangerous accumulation of carbonic acid in the air, there must exist a cause continually diminishing the amount of this gas in the air.

Vegetable life is this cause. Plants absorb carbonic acid from the air, build their substance mainly from the carbon contained therein, and give up a great part of the oxygen to the atmosphere. This is proved by the following facts:

1. Plants cannot grow in air completely deprived of carbonic acid, for, brought into such an artificially prepared atmosphere, they die.

2. When a small, living branch with leaves is brought into a glass vessel containing atmospheric air, the amount of carbonic acid in the latter diminishes, while the amount of oxygen increases, provided the plant be exposed to the sunlight.

Besides the carbonic acid, plants take also water from the air, and part of the latter is found to combine with the carbon resulting from the former. The principal parts of plants, such as woody fiber, etc., is indeed composed of carbon, hydrogen, and oxygen, the latter two in such proportions as to be equivalent to carbon and water. Hence they are termed *carbohydrates.*

Decaying animal matter exerts a favorable influence on the growth of plants, constituting a ready source of nitrogen to the same.

Finally, from the soil wherein the plant has its root, the plant obtains those mineral matters which constitute the ashes of the plant when burnt.

The chemical life of plants thus appears to consist mainly in the decomposition of the carbonic acid taken from the atmosphere. The carbon is accumulated in the body of the plant, while the oxygen is returned to the air. But since carbonic acid results from carbon and oxygen under production of a great amount of heat, heat must be applied to it to separate the carbon from the oxygen. The life of plants, therefore, requires the expenditure of a great amount of heat or power to reduce the compound to carbon and free oxygen. This expenditure of heat is met by the sun's rays. Hence it is that plants grow only in the sunshine.

Since animals cannot live without plants and since the plants require the power of the sunbeam in order to separate the oxygen from the carbon, we see that the sunbeam is the true source of all physical life upon the earth.

Since, finally, the muscular power and the heat of animals are due to the combustion of carbon and oxygen, both furnished them by the sun's action on the plant, the life of animals, both in regard to heat and power, is a direct effect of the sunbeam, being neither more nor less in amount, only changed in form.—*Am. Scientific Monthly.*

Hampshire, Eng., Bacon.

We cut the following from one of our foreign exchanges: The reputation of the Hampshire bacon is owing entirely to the care with which it is cured. The hogs, which are fatted on peas and barley meal, are kept fasting for twenty-four hours at least before they are killed; they are used as gently as possible in the act of killing, which is done by inserting a long-pointed knife into the main artery which comes from the heart. The hair is burnt off with lighted straw, and the dirty surface of the skin scraped off. The carcass is hung up after the entrails have been removed, and the next day, when the meat has become quite cold, it is cut up into flitches. The spare-ribs are taken out, and the bloody veins carefully removed; the whole is then covered with salt, with a small quantity of saltpeter mixed with it. Sometimes a little brown sugar is added, which gives a pleasant sweetness to the bacon. The flitches are laid on a low wooden table, which has a small raised border at the lower end. The table slants a little, so as to let the brine run off into a vessel placed under it, by a small opening in the border at the lower end.

The flitches are turned up and salted every day; those which were uppermost are put under, and in three weeks they are ready to be hung up to dry. Smoking the bacon is no longer as common as it used to be, as simply drying in

the salt is found sufficient to make it keep. Those who from early association like the flavor given by the smoke of wood, burn sawdust and shavings in a smothered fire for some time under the flitches.

When they are quite dry they are placed on a board-rack for the use of the family or are packed with wheat chaff into chests till they are sold. The practice of cutting the hogs into pieces and pickling them in a vat, being attended with less trouble, is very generally preferred when there is only a sufficient number of hogs killed to serve the farmer's family; but flitches of bacon well cured are more profitable for sale. Corn-fed bacon is at least equal if not superior to the barley-fed, which is considered the prime article in England.

Consumption of Alcoholic Drinks by the Wealthier Classes.

We may appeal to any medical man with a knowledge either of metropolitan or of provincial society as to the accuracy of the following computation. We shall admit, in the first place, that there are many men and very many women who drink almost no alcohol. But the greater number of men, and a large number of women, of the middle and upper ranks, habitually take a daily allowance of alcohol far larger than that above indicated. We purposely leave out of sight the reckless "fast" men who are perpetually "nipping" at bitters or absinthe, or "setting themselves right" with just another "brandy and soda;" and also the miserable women—whose numbers none but the doctors even faintly suspect—who indulge in secret dram-drinking. Excluding all such persons from our reckoning, let us merely consider the case of the moderate diners-out and the virtuous dancing young ladies. The former will certainly take on the average eight ounces of strong wines, and twelve to sixteen of light wines, daily; or he will make up the equivalent of this with beer or with spirits; in fact, he will take about three ounces of absolute alcohol, or the equivalent of about a gallon of the puddle-beer that laborers drink. And the young lady will not take less than three fourths of this quantity by the time she has finished her last champagne-cup at the ball or rout. If any one thinks this estimate excessive, we assure him that, were it discreet, we could produce accurate notes of the performances of sundry terpsichorean and otherwise athletic young ladies, of irreproachable character, to which the foregoing facts are a trifle.

It is, in fact, a considerable puzzle to understand, at first, how our respectable classes manage to consume so much more alcohol, without reproach, than the unfortunate Wiltshire clodhopper, for example, can do. No doubt one reason is that their drinks are not muddled with *Cocculus indicus*, etc., as his is. But no doubt the truth is that the intoxicative, that is the *visibly* poisonous effects of alcohol, are mainly kept at bay by powerful exertion either of the muscular or nervous system; and the wealthy classes to a large extent do task either one or both of these systems far more heavily than laborers, except those employed in some specially fatiguing callings. Nevertheless there is grave danger of excess, were it merely from the multiplication of alcoholic drinks which are taken by the richer classes.—*Dr. Austie's "Uses of Wine in Health and Disease."*

A Dangerous Water Pipe.

The following remarks of the Boston *Journal of Chemistry* are worthy of careful study:

"Attention has been called several times in the *Journal* to the dangerous character of galvanized iron pipe, when employed for conducting water to be used for culinary purposes. Instances of severe poisoning from the use of this pipe are continually coming to our notice, and we are led once more to caution our readers against it. It is almost a crime for dealers and manufacturers to recommend this zinc-covered iron pipe for water conduit, as they thereby jeopardize the health and perhaps the lives of purchasers. When this comes from the hands of the manufacturers it has a fresh, clean appearance, and to those who do not understand the nature of the covering the idea is conveyed that it will not oxidize or rust like iron pipes. But this is an error; it will even rust more rapidly than clean iron in most localities. The superficial covering of zinc is rapidly decomposed under the influence of ordinary pond and spring waters, and the oxide, carbonate, and chloride of zinc are formed, which salts are of a deleterious or poisonous character. This covering of zinc on the interior is attacked immediately when water is allowed to flow through, and in some instances we have known it to be entirely removed in forty-eight hours. The insoluble carbonate of zinc is seen to float upon the water in a tea-kettle or other water vessel used in families, and this has often created alarm where no suspicions previously existed."

[The SCIENTIFIC AMERICAN has already called attention to the fact that galvanized iron pipes could only be used with safety for domestic purposes in cases where chemical analysis proved the water to contain nothing capable of combining to form soluble compounds with the oxide of zinc, or capable of dissolving this oxide.—EDS.

Count Moltke, aged 70.

The most potential man in the world just now, says the London *Lancet*, is General Moltke, and the days of his years are threescore years and ten. We will leave military critics to do justice to the military genius of Moltke, and to say where he is to be placed in comparison with Grant, and Wellington, and Napoleon, and Marlborough, and the older heroes of the world. What we design now is much more simple, but equally interesting. The "still strong man," about whom one hears so little, who can be "interviewed" only by Bismark and by the Royal family of Prussia, and without whom all Bismark's grand designs might have been unavailing, the man who is renewing the art of war, and concentrating with such terrible efficiency the whole force and manhood and discipline of Germany, is seventy years old. The King of Prussia, himself seventy-three, has made him a count in honor of his seventieth birthday; but to us it is far more interesting to know that he has reached that age, than to hear that he has become Count Moltke. Grant is not yet fifty years old. Marlborough was all done with war by the time he was about sixty. Napoleon died at the age of fifty-two. Wellington's military career was over before the age at which Moltke began to distinguish himself. Indeed, before the war with Austria, Moltke had kept his power and his genius very much to himself.

Here, then, is a point for physiologists, that a man of seventy may alter the complexion of the world, and the relation of nations, and the history of civilization; that he may at this age have physical power for going through arduous bodily exertion, and mental power for solving the most tremendous military problems. Meantime, let the example of Moltke cheer old men, and make many young men more modest.

Agricultural Items from Various Sources.

PROFITABLE CULTURE.—In March, 1869, Mr. C. A. Hutchinson, of Jacksonville, Florida, planted a plot 50 feet square, with orange seed. In February next the plants were 12 to 18 inches high, when $200 worth were sold at the rate of $20 per hundred. The remainder were transplanted, and are now 2½ to 3 feet high, and occupy a space of 50 by 100 feet, and number about 8,000 plants. They are worth an average of $30 per hundred in the market, making the product of the lot, within two years, $2,600. The expense of seed and cultivation is estimated at about $60.

BANANA CULTURE.—The cultivation of the banana is engaging considerable attention in the neighborhood of Palatka, Florida, and the river counties. Three years ago a gentleman in Orange county set out nine plants, and is now reaping the fruits of a three-acre field, and realizes $125 per month from the fruit and the young plants that are continually suckering around the roots of the old plants. The banana fruits in all seasons, the year round, and is fertilized by the shedding of its huge leaves.

CRANBERRIES.—It is stated that quite an impetus has been given to the sale of marsh lands in Washington Territory recently, by the advent of a New Jersey cranberry grower in quest of these valuable lands. The Oregon *Statesman* says there is a large marsh near Gray's Harbor, in that State, which is already covered with cranberry bushes growing wild, and yielding considerable fruit, which is picked and sold by the Indians. This marsh has been purchased of the Government by several gentlemen of Salem, N. J.

CALIFORNIA WINES.—It is estimated that 700,000 to 800,000 gallons of red and white wine have been made in Anaheim, Los Angeles county, Cal., for this season, and of a better quality than the product of any preceding year. The amount is 250,000 gallons in excess of the yield of any previous season. It is claimed that, owing to the fine weather and the extra condition of the grapes, this wine is already so thoroughly fermented that it will be in a marketable conditon in sixty days. Preparations are being made for the immediate setting out of 300 to 400 additional acres of vines. From 300 to 400 boxes of Malaga grape raisins have been made this year, as an experiment, and are said to be of unusual size and flavor, and superior to any in the market. Don Mateo Keller, one of the largest wine-makers of Los Angeles, has expressed 100,000 gallons of pure juice this season. The San Francisco *Commercial Herald* states that the total shipments of domestic wines from that port to New York from the beginning of 1868 to about the first of July of the current year, were 848,637 gallons of all grades.

Of this quantity the United Anaheim Winegrower's Association shipped 237,600 gallons. G. Groesinger's shipments averaged $40,000 per annum, and the proportions were two thirds white or hock, and one third port, angelica, sherry, muscatel, etc. The usual prices charged were, for white or hock, 50 to 70 cents per gallon; port, $1·25 to $1·50; angelica, $1 to $1·25; sweet muscatel, $1 to $1·50; sherry, $1 to $1·50. I. Landsberger & Co. shipped 2,500 cases of champagne, 4,000 cases and 40,000 gallons assorted, besides 250 cases of wine bitters. Kohler & Frohling shipped about 120,000 gallons. The Lake Vineyard Wine Company consigned 45,577 gallons of port, 24,826 gallons of angelica, 40,353 gallons of white, 31,147 gallons of claret, 4,071 gallons of sherry, 8,758 gallons of grape brandy, etc. There were several smaller shippers whose consignments are included in the grand total above given.

CALIFORNIA COTTON.—A scientific expert in cotton states that the cotton grown from Alabama seed in Merced county, Cal., this year, compares favorably with Brazilian and Egyptian cotton, and is superior to the best Southern upland for spinning purposes. He asserts that the effects of the dry and equable climate of California is an improvement in the staple yielded from the same seed as planted upon Southern uplands. There are large sections of the State well adapted to this culture.—*From the U. S. Commissioner's Report for November and December*, 1870.

The Iron Trade.

A convention of the representatives of thirty-one out of forty-eight blast furnaces in Western Pennsylvania and Eastern Ohio was held at Sharon, Pennsylvania, on December 29, 1870, to consider the interests of the business. The call for the convention stated that its object was to take into consideration the best means of obtaining a reduction in the prices of Lake Superior ores, dockage, lake and railroad freights, and labor at furnaces, so as to produce pig iron at less cost, in order to meet competition. It was also stated that unless a considerable reduction in the cost of ore and labor can be secured the iron furnaces will not yield a profit to the owners.

At the convention one of the members asserted that not even four or five of the Monongahela furnaces are making money. It was contended that the railroads charged too high freights, and that the dealers in ore at Cleveland charged two and a half per cent commission, while one per cent would be ample. It was also argued that the furnace men ought not to be compelled to pay for the ore with four months' notes until it is delivered, and that the present plan of dating the notes from the time when the ore was contracted for was unjust. Complaints of short weight, amounting to four per cent, were also made. Suggestions were made that an iron clearing house, to manage business at an expense of $38,000 a year, should be established. Nothing definite, however, was determined, but committees to examine into the above-mentioned subjects were appointed, with directions to call a mass meeting, to be held in Cleveland next February.

Woolen Rags and Shoddy.

Some thousands of tuns of rags are collected in England and thousands more imported. In the manufacture of shoddy, the careful cutting and sorting and the proper classification of the various qualities of rags is the most important stage; for this great experience is required. The mechanical department is supplied by washers, rag-tearers (vulgarly called devils), and scribbling engines. The washer is of the same description as a flock engine or grinder. The rag-tearer consists chiefly of a large cylinder, the surface of the circumference of which is covered with teeth, spiked coarse or fine, according to the rag to be torn. The scribblers are machines used in opening wool. The price of woolen rags depends upon the precise kind of woolen rag; from £5, with intermediate prices, to as high as £70 and £80 per tun are given. The manufacture of flocks and mill pulp is generally carried on with that of shoddy. In Yorkshire shoddy mills are legion; in Gloucestershire there are many.

Precautions Against Fire in Paris.

As soon as the investment of Paris was completed, the authorities took measures for preventing the destructive effects of shelling. Bills were printed and affixed to almost every house with directions for stopping the fire set up by the bursting of shells. Large tubs filled with water were placed on every floor of the large houses and private buildings. Although covered carefully with canvas, the water, having been left for weeks and weeks, became corrupted and fetid. Proper instructions were given for stopping the infection by the using of charcoal. Two of these tubs are placed in the hall where the French Academy held its sittings, and two others in the *Salle des pas perdus*, by which visitors and members are introduced to it.

HEATING BUILDINGS.—Some one has wisely said: "Instead of asking ourselves with how little fuel can I warm my house? the question should be, How much can I afford to pay for fresh supplies of air, moderately and equally warmed, and distributed without waste?" Instead of this, says the *American Builder*, most of our friends are making arrangements for stopping the flues where no fire is kept, in order to keep the heated air in. If you have a grate in your room, in which you do not need a fire, be assured that it will, if left open, carry off more impure air, which you would otherwise breathe, than you are aware, and that the sum of your health and happiness will be greatly increased by leaving it open even during the coldest weather. It is an excellent ventilator, and the extra heat you will require on account of its use may prove much cheaper than the fee of your physician, should you yield to the notion that it must be stopped to keep the warm air in.

PYROXYLINE DISSOLVED IN OILS.—*Xylonite* differs from *Parkesine* in respect of the solvents employed—fixed oils, such as castor and linseed oils, being used for this purpose, as well as wood naphtha, alcohol, and other of the hitherto well-known solvents. In order to render the oils solvents of pyroxyline, it is necessary to heat them previously, then dissolve a portion of camphor in them, after which they become solvents of pyroxyline. This, Mr. Spiller pointed out, is a new fact in science. The cotton used for this purpose was the lowest form of gun cotton, and burnt very slowly on account of its low nitration. The temperature of the oil has to be raised to 300° Fah. in order to dissolve the cotton. The cotton is prepared by immersing it in four parts of sulphuric acid to one part of nitric acid at a low temperature.—*Br. Jour. of Photo.*

NEW REMEDIES FOR BURNS.—Two new remedies for burns are added to the long list. The first is charcoal. A piece of vegetable charcoal laid on a burn at once soothes the pain, says the *Gazette Medicale*, and if kept applied for an hour cures it completely. The second one is sulphate of iron. This was tried by M. Joel, in the Children's Hospital, Lausanne. In this case a child, four years of age, had been extensively burnt, suppuration was abundant and so offensive that they ordered the child a tepid bath, containing a couple of pinches of sulphate of iron. This gave immediate relief to the pain, and being repeated twice a day—twenty minutes each bath—the suppuration decreased, lost its odor, and the child was soon convalescent.—*Medical Press and Circular.*

VERY intimate relations exist between the sun and digestion. Digestion and assimilation become weak and imperfect if the man or animal is not daily exposed to the direct rays of the sun.

PERPETUAL MOTION.

NUMBER VII.

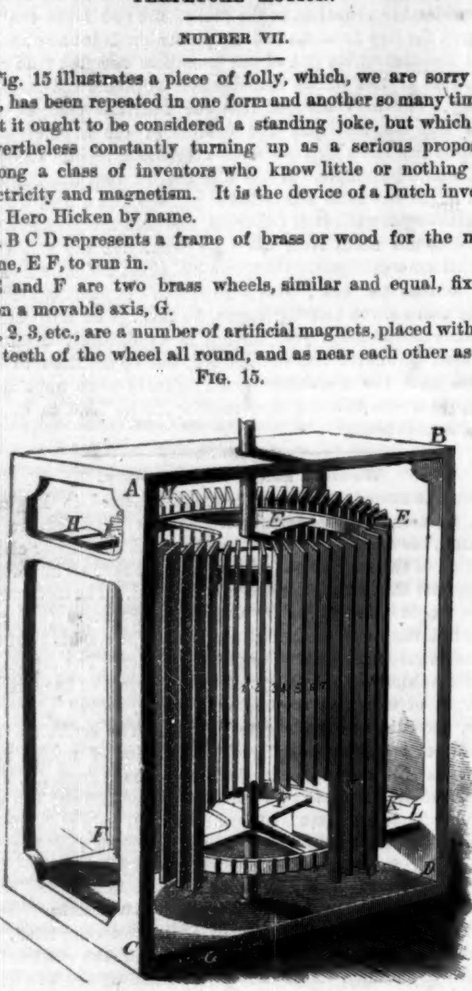
Fig. 15 illustrates a piece of folly, which, we are sorry to say, has been repeated in one form and another so many times that it ought to be considered a standing joke, but which is nevertheless constantly turning up as a serious proposal among a class of inventors who know little or nothing of electricity and magnetism. It is the device of a Dutch inventor, Hero Hicken by name.

A B C D represents a frame of brass or wood for the machine, E F, to run in.

E and F are two brass wheels, similar and equal, fixed upon a movable axis, G.

1, 2, 3, etc., are a number of artificial magnets, placed within the teeth of the wheel all round, and as near each other as is

FIG. 15.



possible, provided they do not touch; their north poles at E, and their south poles at F.

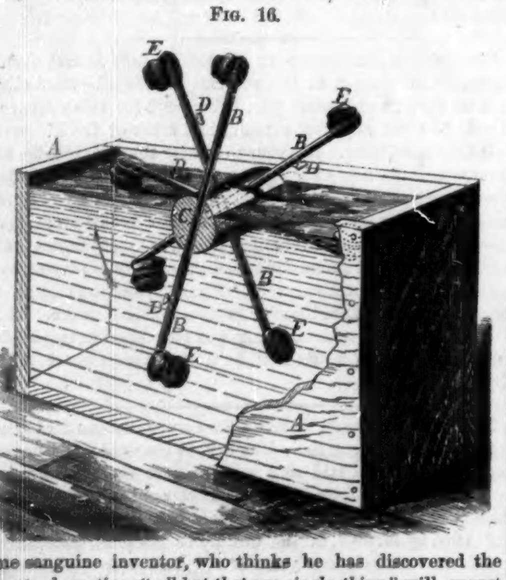
H and I are two similar and equal magnets fixed in the brass plate, A C, very near each other, but not touching.

K and L two more fixed in the brass plate, B D.

Now, as the north pole of one magnet repels the north pole of another magnet, and attracts the south; and inversely the south pole of one magnet repels the south pole of another, and attracts the north; so the south pole, I, attracts all the north ones at E; and the north pole, H, repels all the north ones at M. In like manner, K attracts at N, and L repels at O, and by this means the whole machine, E F is expected to move perpetually round.

Now this would be all lovely if magnets did not attract in more than one direction. Many American inventors have tried the same principle over and over only to find their wheel standing still, and have then sighed for some septum which, interposed between a magnet and its armature, would prevent attraction while thus interposed. The editorial sanctum of the SCIENTIFIC AMERICAN has often been compelled, in answer to correspondence, to confess its ignorance of any substance of which such a septum could be constructed. Humiliating as is the confession, we never have heard of this long-sought for desideratum, and what is more, we expect to leave this sublunary sphere before its discovery. But we do expect, judging from past experience, that about once a month

FIG. 16.



some sanguine inventor, who thinks he has discovered the perpetual motion, "*all but that one single thing*," will expect us to point him the way to success by supplying to him (privately, of course), the knowledge of the septum sought.

This idea of a magnetic perpetual motion is just now the most prevalent one of all, and if what we have said shall serve to open the eyes of the many who are eagerly following what must prove to be only a delusion and a snare, our purpose will be accomplished.

Fig. 16 is an engraving of a supposed self-moving machine sent us by S. H. Davis & Co., of Detroit, Mich. They state that it is the invention of the late William Davis of that city who spent a great portion of his time in the attempt to make a self-moving machine.

A, in the engraving, is a tank containing water, as shown. The hollow arms, B, communicate with a hollow shaft, C, and the bellows, E—screw valves, D, being employed to increase or diminish the area of the passages in the hollow arms, B. Each of the bellows, E, carries a weight, which, during a portion of the revolution, compresses the bellows and forces the air out of it through the hollow arms, B, and shaft, C, into bellows upon the opposite side of the wheel, which, being inverted, are expanded by the action of the weights, and their buoyancy being thus increased on one side of the wheel, the latter is expected to turn constantly by virtue of the effort of the expanded bellows to rise to the surface. This is one of the most plausible devices we have ever seen, and it will puzzle many to conceive the real reason why it will not move as it is expected to do. The fallacy will be, however, apparent to those who are familiar with the laws which govern the pressure of fluids, and who know that whatever buoyant power a body will exert in rising out of a liquid in which it has been immersed, is precisely that which was expended in forcing it below the surface to the point from which it begins to rise.

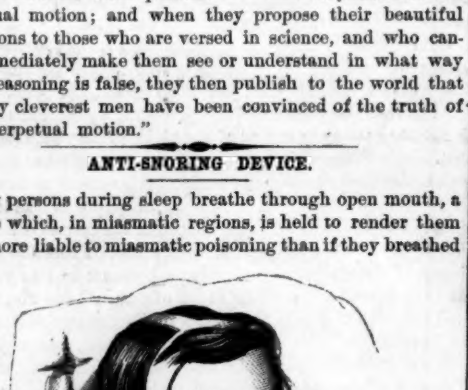
Says M. De la Hire:

"There is not any of those who pretend to have found out perpetual motion, who do not agree that two weights placed in a position to move, following their natural direction in equal time, or in any way reciprocal to their weight, remain in equilibrium. Yet there is no perpetual motion scheme where one cannot draw a conclusion quite opposed to this principle; for, whatever may be pretended, perpetual motion is nothing more or less than the elevation of one weight to a certain hight by the descent of another weight at the same time; and reciprocally the restitution of the first to the place where it was before its movement, by the descent of the one that had been raised, and so on *ad infinitum;* sometimes by means of weights, which, being raised, in their fall agitate other weights; sometimes, by means of liquid bodies, which, being raised, can run, and move other parts far separated from the center of motion; from which no advantage can be derived, and which is entirely contrary to the preceding principle.

"Those who occupy themselves with this chimera, find nothing but embarrassment, for generally their machines have so many weights, etc., to move them, that their inventors forget always to be on their guard against the many hinderances that arise—the hight, etc., of the powers employed, their natural direction, etc.—all these are sometimes so strangely jumbled together that it requires very hard work to be able rightly to distinguish them. This is one great reason that leads such persons to a false demonstration of perpetual motion; and when they propose their beautiful inventions to those who are versed in science, and who cannot immediately make them see or understand in what way their reasoning is false, they then publish to the world that the very cleverest men have been convinced of the truth of their perpetual motion."

ANTI-SNORING DEVICE.

Many persons during sleep breathe through open mouth, a practice which, in miasmatic regions, is held to render them much more liable to miasmatic poisoning than if they breathed



entirely through the nose, the hairs on the inside of the nostrils acting in some measure as a filter to prevent the entrance of miasmatic exhalations.

To prevent sleeping with the mouth open, M. F. Pinckard, of New Orleans, La., patented, through the Scientific American Patent Agency, Dec. 15, 1868, the "Sanitary Brace," illustrated in the annexed engraving. Its operation is sufficiently plain without further description, and it effectually prevents the dropping of the jaw and the opening of the mouth during sleep. It has also been suggested that the device would be a preventive of snoring, as it is asserted from the same source, that people do not snore when the mouth is closed.

The Hartford Steam Boiler Inspection and Insurance Company.

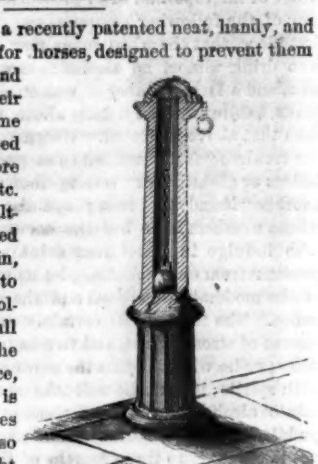
The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for November, 1870:

During the month 457 visits of inspection have been made, and 885 boilers examined—787 externally and 271 internally, while 126 have been tested by hydraulic pressure. Number of defects in all discovered, 566, of which 64 were regarded as dangerous. Defects in detail: Furnaces out of shape, 18; fractures, 54—8 dangerous; burned plates, 30—8 dangerous; blistered plates, 36—3 dangerous; cases of sediment and deposit, 109—6 dangerous; cases of incrustation and scale, 114—2 dangerous; cases of external corrosion, 34; cases of internal corrosion, 30—4 dangerous; cases of internal grooving, 4; water gages out of order, 51—11 dangerous; blow-out apparatus out of order, 7—3 dangerous; safety valves overloaded, 11—5 dangerous; pressure gages out of order, 64—3 dangerous, varying from—7 to +15; cases of deficiency of water, 4—3 dangerous; broken braces and stays, 26—3 dangerous; insufficient bracing, 8—5 dangerous; boilers condemned, 2.

We have no room for comment, but the record shows that there is great neglect in the management of steam boilers. We hope every engineer under whose eye this record may come, will see that none of the defects enumerated above can be found in, or on, the boilers and connections under his care. There were 13 explosions during the month, attended with fearful loss of life and property. Twenty-five persons were killed and 29 wounded.

IMPROVED HITCHING POST.

Our engraving shows a recently patented neat, handy, and tasty iron hitching post for horses, designed to prevent them from breaking halters, and to give free play to their heads, while, at the same time, they are prevented from entangling their fore feet with the strap, etc. The ring to which the halter strap is tied is attached to the end of a chain, which chain is attached to a ball or weight in the hollow of the post. A pull on the strap hoists the weight a short distance, and when the strain is lessened, the weight takes up the slack again, and so keeps the strap drawn tight within certain limits.



Threaded Envelopes.

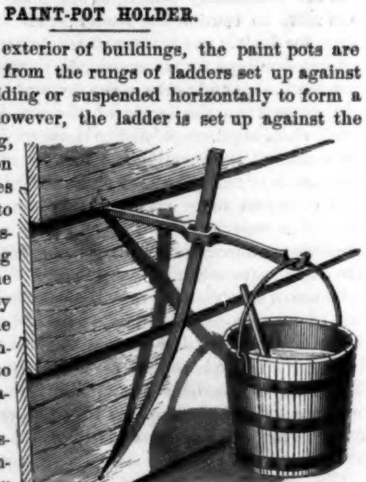
A new form of envelope has recently become quite popular in Germany, and possesses the convenience of enabling one to open a letter when completely sealed up without the ordinary difficulty of finding an entrance. The arrangement consists in introducing a thread, which projects from one of the corners, by pulling which the lower edge of the envelope is cut through without injury to the inclosure, the address, or the stamp.—*Exchange.*

That is not new to us. Some three or four years ago it occurred to us that a device for opening envelopes would be welcomed by the public, and we prepared one with thread inserted as above described, and sent it to Munn & Co., of the SCIENTIFIC AMERICAN for examination. They wrote to us that a similar invention had been patented and we prosecuted the matter no further. Now it comes out as something new.—*Monmouth (Ill.) Atlas.*

[The above contrivance is very old, and has been many times re-invented. During the past year it has been sent to us perhaps twice a week on an average by inventors residing in different parts of the country, each of whom has solicited our aid to obtain a patent. We have been obliged to inform them that the attempt would be useless, and have advised them to save their money. We think that the statement that the thread envelope is popular in Germany is a mistake. Ordinary envelopes are opened easily enough, and there is no demand for the threads.—EDS. SCI. AM.

PAINT-POT HOLDER.

In painting the exterior of buildings, the paint pots are usually suspended from the rungs of ladders set up against the side of the building or suspended horizontally to form a scaffold. When, however, the ladder is set up against the side of the building, and the application of the paint requires reaching away to a considerable distance, the suspending of the pot near the brush saves loss by dropping, and time and labor in reaching from the pot to the point of application.



The device illustrated in the accompanying engraving provides for this. The pot is hung to a horizontal bar whose inner end has studs to engage the lower side of a weather-board, and this bar has pivoted to it a forked lever whose lower pointed ends engage the wall.

This device was patented January 8, 1867.

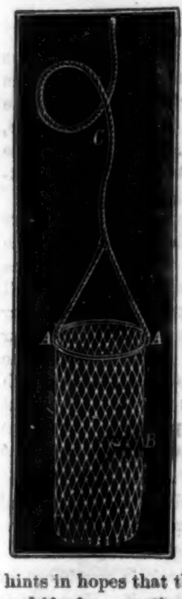
REPRODUCING FADED PHOTOGRAPHS.—The faded print is carefully removed from the cardboard on which it was mounted; and after the removal of all the paste it is rendered translucent by being charged with wax. It is now used as a *cliché* for printing its image upon a glass coated with collodio-chloride of silver, the action of which is intensified by a previous subjection to the fumes of ammonia. After the exposure, further density is conferred by a development with gallic acid and silver. The negative thus obtained is varnished and employed for printing in the usual way.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Life Preserver for Hotels and other Lofty Buildings.

MESSRS. EDITORS:—While reading an account in the papers of the great loss of life at the burning of the Spotswood Hotel, in Richmond, a very simple and inexpensive means of escape in case of fire suggested itself to my mind, and I give it to you for publication, if you think it worthy of pratical application. Let A in the sketch given be an iron hook of suitable strength to retain its form, and bear the weight of an ordinary man. Let B be a bag of net work, made of rope about the size of a clothes line, and secured to the hoop; and C, a rope attached to the bag, and long enough to reach from a window to the pavement beneath, with slack to secure it to any object in the room, even at a distant point. With an arrangement of this kind in the rooms on the upper floors of a hotel, every man, woman, and child might escape in perfect safety, the last man, of course, would have to slide down by means of the rope itself. The bag ought to be made about $4\frac{1}{2}$ feet high, or perhaps a little above the waist would answer; and in case of infants and children being put in, they would have plenty of air through the open spaces. It will be necessary to use a bag, because being perfectly pliable the party in it could more readily assist in launching himself or herself off the sill of the window; for in case of having to lift out an affair of the kind with its human freight, more strength would have to be brought to bear than person at the top could easily put forth. I have thrown out these hints in hopes that the may lead to the saving of human life, and if of no practicel value in themselves, possibly some one may be thereby induced to bring out an invention that will answer the end in view.



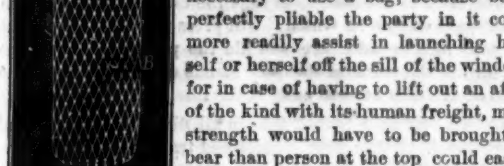
HUMANITY.

Baltimore, Md.

Boring Segment of Hollow Cylindrical Ring.

MESSRS. EDITORS:—In your issue of the 20th of November L. V. asks this question: "Will some practical mechanic tell me how I can bore out true a segment of a hollow cylindrical ring, the segment being the sixth part of such a ring, the diameter of which is two feet, and the diameter of the bore being required to be six inches?"

I sent you what I supposed to be a true plan for the purpose, but in your issue of December 17th you ask me, "Have you not mistaken the drift of L. V.'s query?" In reply I answer, yes. And now, fully understanding your correspondent's wishes or statement, I propose to try it again:



Make a wooden frame, into which fasten the segment to be bored, with the bore down. Place this frame in front of an engine lathe opposite the face plate. Turn a piece of round iron about one third the diameter of the bore of segment, and bend it over a turned circle the same as desired (viz., two feet); pass it through the segment and fasten it to the frame rigidly. In the exact center of the segment on this bent bar or mandrel make a sliding head some four inches long (in halves and rabbeted) so as to move freely through the segment. Feather the same, if liable to turn in the least. In the center of this slide turn a collar, and thereon place a ring with a cutter in the center. Set the cutter out to take a cut, and hold the loose ring with a set screw. Now it is very evident that if you push this slide through the segment you will cut a groove to correspond with the circle of the mandrel. Draw it back and loosen the set screw and turn the ring for a new cut. Tighten with the set screw, and renew the operation until the circle is complete. I propose to use the face plate of the lathe for a crank, and employ connecting rods from the crank pin to the slide for the purpose of driving it. This is an expensive method, but I am sure it is a good one.

H. WHEELER.

Silver Creek, N. Y.

[We fear all our readers will not share the confidence our correspondent feels as to the practicability of his method. We see many practical difficulties in the way of getting a true job in the manner specified. However, as it is an attempt to solve a difficult problem, and suggests thought, we give it for what it is worth.—EDS.

The Great American Desert a Myth.

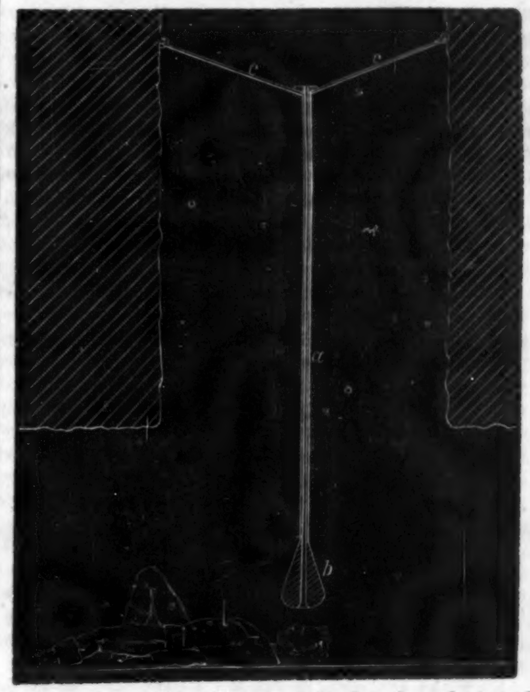
MESSRS. EDITORS:—A short time ago I read a short article on the barrenness of the land west of the Missouri River, which conveys a very wrong impression. After over 5,000 miles travel over the plains, mostly on foot, I am thoroughly convinced that there is but very little which cannot be utilized. I was taught in my schoolboy days the magnitude of the great American desert, but, with the exception of the sand bluffs along some parts of the Platte River, and a sand tract about twelve miles wide a little south-east, and about sixty miles from what used to be named the junction on the South Platte, I have failed to find it. All over the plains there are indications of water near the surface, and springs are frequent in the bluffs. As for the soil it is very rich. I am more willing to trust my own eyes than the speculations of others.

T. L. VON DORN.

Omaha, Nebraska.

The Hoosac Tunnel.

MESSRS. EDITORS:—In your issue of Dec. 24th, No. 26, Vol. XXIII., is an article from the pen of G. C. Breed, on the difficulties of getting a correct plumb line, etc., in the Hoosac tunnel. Now, Messrs. Editors, I am not an engineer, but occasionally do some thinking, and this article suggested the



idea to me that if the thing cannot be done from the top of the shaft by a long plummet, why can't it be done from the bottom from a short-sighted one.

I give you a rough sketch of my idea. We will suppose a rod or tube, *a*, suspended by strings, *c*, or in any other convenient way, in the center of the bottom of the shaft, the rod or tube being hollow or sighted like a gun barrel. Why couldn't a person, looking through it or its fine sights, get the point as it ought to be, either at the top of the shaft or by a star or some other point in the sky.

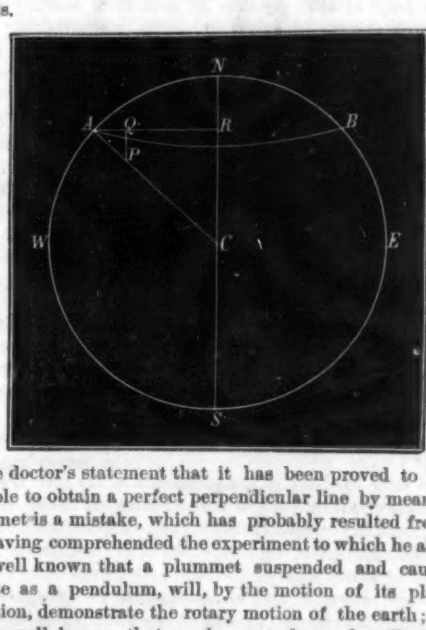
I do not believe in perpetual motion, or any thing of that kind, but in my experience I find that if a thing cannot be done in one way it is no sign that it cannot be done in another. This suggestion may expose my ignorance, but still take it for what it is worth.

CYRUS COLE.

Havana, N. Y., Dec. 24, 1870.

Can a Perpendicular be Obtained by Means of the Plumb Line?

MESSRS. EDITORS:—As Dr. Heirry's article, in your issue of December 10th, has impressed an erroneous idea upon some of your readers hereabouts, I submit the following for the purpose of enlightening the doctor upon the subject, as well as such of your readers as have been misled by his statements.



The doctor's statement that it has been proved to be impossible to obtain a perfect perpendicular line by means of a plummet is a mistake, which has probably resulted from his not having comprehended the experiment to which he alludes. It is well known that a plummet suspended and caused to vibrate as a pendulum, will, by the motion of its plane of vibration, demonstrate the rotary motion of the earth; and it is also well known that a plummet dropped will strike a point below, eastward (not westward, as stated by Dr. H.) of a vertical through the point whence it was dropped; but these facts by no means prove that a plummet may not be suspended so as to indicate a true vertical line, all of which will readily be understood from the subjoined diagram and explanation.

Let E W N S represent a horizontal section of the earth through its center, and let A B represent a parallel of latitude through A, which may represent the mouth of the central shaft in the Hoosac tunnel in lat. 42°, say L; and let P represent a point at the bottom of the shaft vertically below A; let A R be perpendicular to the earth's axis, S W, and let P Q be parallel to S N. Then, because the earth revolves on its axis, all parts not in the polar axis have an eastward motion in space which is proportional to their distance from the polar axis; therefore the eastward motion of a point at P (which is at the same distance from the axis as the point at Q) will be less than the eastward motion of the point at A. But the point, A, will make a revolution about R in one sidereal day—about 86,160 seconds. Hence, we readily find the difference per second of the velocities of the points, A and P, to be $\frac{2a\ \pi\ cos.\ L}{86{,}160}$ 8=0·671 of an inch nearly, *a* being the depth of the shaft.

Now, for a plummet to face through 1,090 feet will require about 8 seconds of time. Hence a plummet would fall to the bottom of the shaft of the Hoosac tunnel in 8 seconds, and consequently it would fall east of the point vertically below the point from which it was dropped, a distance $=\frac{2a\ \pi\ cos.\ L}{86{,}160}\times 8=5{\cdot}37$ inches, nearly.

But if the plummet is suspended in a vessel of oil, for instance, as you suggest, which vessel rests upon the earth at the point, P, it is clear that when the plummet is at relative rest within the oil, it will have lost a portion of the motion it had when at the point, A, and will have precisely the same eastward motion as the point, P, and will therefore be at rest, relative to the oil, when vertically below A.

Des Moines, Iowa. J. E. HENDRICKS.

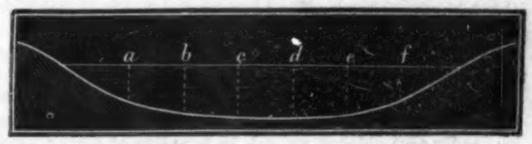
To Estimate the Power of a Stream.

MESSRS. EDITORS:—Almost every man has about him in his daily walk sufficient apparatus for a tolerably accurate estimate of the quantity of water flowing in any stream. A walking-stick, a jack-knife, and a watch, provided the walking-stick is just three feet long, are all the tools necessary for the purpose.

Take a section of the stream as uniform in breadth and depth as possible, and measure off upon its bank some definite length, say from one to four hundred feet, according to the rapidity of the water; set a stake close to the water at each end of this section, then throw into the water, opposite the upper stake, a green twig or limb of a tree, or other object of such specific gravity as to nearly, but not quite, sink, and of such size that one portion shall remain at the surface while another portion nearly touches bottom; the object being to get the average speed of the water; the resistance caused by the bed and banks of the stream necessitate some care in this part of the experiment.

Note accurately the time the object is passing from stake to stake, and repeat the operation several times and at as many points towards the opposite shore; the sum of the several times divided by the number of points at which the speed was taken gives the average speed of the water.

Now measure the depth at several equidistant points across the stream, as at *a*, *b*, *c*, *d*, *e*, *f* (the diagram representing a cross section of the stream), the sum of these depths divided by the number of points at which the depth was measured



gives the average depth; this average depth multiplied by the breadth of the stream gives the area of the cross section; this area, multiplied by the length of the section, gives the cubic contents of body of the water embraced in the section. Thus we have the quantity and its velocity, which are the elements necessary to show the value of a stream for manufacturing purposes, provided it has sufficient fall anywhere to render it available.

Allowing sixty-two pounds for each cubic foot of water, and a supply of one thousand cubic feet per minute, and a fall of ten feet, we have $1{,}000\times 62=62{,}000$ pounds, $62{,}000\times 10=620{,}000$ pounds momentum, $620{,}000\div 33{,}000=18{\cdot}7$-horse power. One fifth at least must be deducted for friction and loss, making in this case about 15-horse power.

F. G. W.

Popular Errors Regarding the Watch.

MESSRS. EDITORS:—A hunter's (or close) case is almost universely supposed to be the best protection for the watch; it is also supposed that it prevents the breaking of glasses, that it better protects the movements from dust, and that in all things is the most desirable to have—to all of which I wholly dissent.

Every watchmaker of experience and observation knows that a close case permits more dust and lint to get into the movement than an open one, for the reason that the case over the glass, which springs open on being unlocked by the push in the stem, necessarily fits loosely down on its place, to allow it to open by the force of the lifting spring. If it snapped, like the opposite side, the spring could not lift it open. The dust finds its way inside the cover, through this loose fit, and thence it works its way into the movement through the opening left for the lifting spring to act on the case, and through the opening around the locking spring, which holds the case shut; the hole through the stem, through which the push-pin acts, also permits dirt to pass inside. There is also another trouble in close-case watches, which is, that the lifting spring is constantly bearing upwards on the cover, and every time the case is opened the hinge (joint) is worn a little. After opening many times, the joint becomes much worn, and more or less open, affording an additional place for

the dust to enter. Particularly does this occur when the case is allowed to fly back against the joint with a force proportioned to the strength of the lifting spring and the weight of case, thus adding to the natural wear a stretching open of the joint, that very soon allows the dust to pass in quite freely. All these causes conspire to foul the movement in a very short time.

In the open-faced watch not one of these openings exist for the admission of dust; the rim (bezel) which holds the glass closes with a snap-joint; the back case closes with the same snap, there is no opening through the stems, and the whole case, if properly made, is water-tight, and will remain so for years, thus affording almost perfect protection to the movement from dust.

The serious inconvenience caused by the rapid accumulation of dirt in the close cases, has stimulated inventive genius to devise ways and means to remedy the defect. "Dust rings" thus far have been the only product of this inventive labor; some are placed around the edge of the movement; some go inside the case; neither kind are entirely successful in excluding the dust. The only possible advantage in the use of the close case is, that it may be continued in use after the glass is broken. An open-face watch must be laid up if the glass breaks till another can be had; but only the very heavy cases protect the glass from breakage, and probably three fourths of the close cases in use are supported by the glass, instead of affording protection to it; and particularly is this the case with ladies' watches in which the glass must be flat, and very thin.

There is no doubt but that more glasses are broken by the use of close cases than would be broken if open cases were in general use, the latter admitting of much thicker and stronger glasses. Neither are the very heavy close cases the protection to the movement that many suppose; one sufficiently heavy to prevent being crushed, is well, but all the weight of metal beyond that is dangerous, and for this reason, that in the event of the watch falling, or enduring any sudden jar, the momentum of the massive case produces a concussion which must damage some part of the movement, thus its very strength proves destructive.

For the benefit of the "craft," I advise the use of "hunter's cases;" for the good of the wearer, most certainly "open" ones. R. COWLES.

Cleveland, O.

Nitro-Glycerin Explosions.

MESSRS. EDITORS:—In your issue of November 19th, 1870 you refer at some length to the recent explosion of nitro-glycerin at Fairport, Ohio.

In the article referred to you denounce in a very emphatic manner its manufacture and use as a blasting agent. As I have been engaged in its manufacture for two years, and have possibly as much practical knowledge of it as most men, I beg you to allow me space in your valuable journal to vindicate, in some degree, this much abused substance.

In the first place, without attempting to disparage the general accuracy of the report of the Painesville (Ohio) *Telegraph*, further than to call attention to their sensational style of reporting such matters, I will state a few facts in relation to the explosion not generally known, but which, if published, will go far to allay the popular fear of nitro-glycerin.

On the day of the explosion there were 15,000 pounds of the substance in the magazines (equal in explosive force to 195,000 pounds of gunpowder) all of which exploded almost simultaneously. Nevertheless we find by actual facts that its deadly area did not extend to a radius of eighty yards, and that the concussion was incapable of exploding a quantity of nitro-glycerin in an exposed position eighty feet from the nearest magazine. Again, the effect upon the houses in Fairport has been ridiculously exaggerated. Ruinous previous to the explosion, all the dwelling houses, thirty or forty in number (the nearest being about 600 feet from the magazines), have since been put in good repair by an expenditure by the nitro-glycerin company of a sum not exceeding eight hundred dollars.

As to the assertion that the shock was communicated through the earth 160 miles, I think it is simply puerile and unworthy of consideration. For why was not Cleveland, only thirty miles distant, also moved by the shock? The inhabitants in that city did not even hear the report. May not, however, the theory of a simultaneous earthquake be entertained on good grounds of belief? It is on record in the public prints that on the same day and about the same time of the explosion, the shock of an earthquake was distinctly felt in Canada, the States of New York, New Jersey, and Pennsylvania. The working of telegraph wires was in some places interrupted, and many individuals are reported as having experienced the peculiar feeling of nausea which is said to be the concomitant of earthquakes. Taking these circumstances into account you can, of course, draw your own inferences.

In Gainesville (notwithstanding sensational reports) no consternation was caused, and no damage was done. Many people did not even know of the explosion. Others hearing the noise thought it was the firing of a cannon or, perchance, the explosion of a steam boiler.

You refer to the case of a man sick with typhoid fever having been instantly killed by the shock. Dr. Jackson, the physician in attendance upon the man, declared upon oath last week that his patient, previous to the explosion, was moribund, and died some time after the explosion.

Apart from the assumption that this explosion may have resulted from an earthquake, I can easily believe that it may be accounted for thus: The unfortunate men were engaged in removing from the magazines some earthenware jars containing nitro-glycerin in a partially frozen or solidified state, and I assume that one jar must have been let fall upon another accidentally, which, striking against each other with sufficient force, would fully account for the unfortunate occurrence.

I will now, if your space will permit, state my conviction, induced by large experience, that the manufacture and handling of, and the blasting with, nitro-glycerin can be carried on with perfect immunity from danger. During its manufacture I cannot conceive any circumstances under which it may explode. In my experience I have seen at the same time two vessels, each containing six pounds of nitro-glycerin in a state of incandescence, caused by a small quantity of unconverted glycerin lying on the surface of the crude nitro-glycerin. This apparently alarming phenomenon proved to be perfectly innocuous, as on precipitating the unconsumed contents of the jars in water, I found that ten pounds of nitro-glycerin had been consumed gradually and without explosion or instantaneous decomposition. Can a correlative case be quoted as to gunpowder?

Undoubtedly in the safe manufacture and using of nitro-glycerin certain conditions must be implicitly complied with, the chief of which conditions are, persistent forethought and caution. All the employés of the Lake Shore N. G. Company were duly advised on their engagement of the nature of the product, and were well instructed in the mode of handling the same, but "familiarity may have bred contempt;" carelessness may have been the result, and hence the catastrophe.

During the last two years the Lake Shore Nitro-Glycerin Company have manufactured about 150,000 pounds of nitro-glycerin, equal in explosive force to 1,950,000 pounds of gunpowder, all of which has been used for blasting purposes without the loss of one single life. Has gunpowder a similar record? Indeed the very fact that miners were certainly unconversant with the rudimental principles of chemistry, have (taking their safety into consideration) decided wherever it has been introduced, in favor of nitro-glycerin, shows beyond doubt that the dangerous properties of nitro-glycerin are merely hypothetical.

I have been a regular subscriber to your invaluable journal for the last twelve months, yet, notwithstanding that many casualties, through the use of gunpowder, attended with the loss of many lives, have occurred during the same period, I have not seen that you have censured those manufacturing or using it.

Since the explosion in Fairport I have observed in the public prints that in various parts of this country and in Europe seventy people have lost their lives and many more been injured by the accidental explosion of gunpowder and gun cotton, all of which you pass by without comment.

In conclusion, may I venture to suggest to you that it is impolitic, not to say unfair, to decry and condemn any branch of national industry simply because some serious accidents have occurred in its development.

Look back through the histories of gunpowder and the steam engine—two of man's most indispensable servants—and note the black record of death upon their pages, and then say if nitro-glycerin deserves the anathema you have hurled against it. SAMUEL THOMPSON,

Chemist to the Lake Shore Nitro-Glycerin Co.

Painesville, Ohio.

[We are always willing that both sides of a question shall be heard. In this case we allow an advocate of nitro-glycerin to speak with peculiar satisfaction, since we think every candid mind will, upon reading his communication, rise with strengthened belief that nitro-glycerin is too dangerous a substance for general and indiscriminate use. Since the explosion at Fairport another man has been blown to atoms at the Hoosac Tunnel, and the black record will keep increasing so long as nitro-glycerin is used as a blasting agent. Only such exigencies as rarely occur in engineering work should, in our opinion, justify the use of this deadly explosive. Our correspondent's theory of an earthquake occurring simultaneously with the Fairport explosion strikes us as particularly humorous, if such a thing as humor may be tolerated in so serious a matter. So far as we have been able to learn from the accounts of the many disasters caused by such explosions the earth has in every case literally quaked at the power of an agent that can instantaneously annihilate human beings so that notrace is left of them.—EDS.

Chemistry in Relation to Practical Agriculture.

MESSRS. EDITORS:—A writer of great intelligence in a recent number of a prominent agricultural journal in Richmond, Va., declares his conviction that science, and especially chemistry, does not aid practical agriculture? *Per contra*, the statement of one fact may illustrate the fallacy of his conclusion more briefly than his argument to "prove a negative":

This farm has been in the possession of my forefathers for more than one hundred years, and during all of that period a bed of peat has occupied a central and comparatively elevated position. Moreover, since my boyhood here (during more than forty years) some of the best practical farmers in Delaware have rented it, and never paid, on an average, a sufficient amount to equal the rent of my dwelling in Baltimore. Since 1865 one half has increased in productiveness, yielding last year an income of $7,000, and an aggregate of $14,000 during the preceding three years, and I depend on this peat to make the other half equally productive and indirectly sustain the crop as above. Its value, however, was not ascertained until last summer, and then as one of the first essays in analysis of my son, which I subsequently verified. We both agreed that the nitrogen or quasi ammonia, when valued at the same rate as we pay for it in Peruvian guano, would pay for excavation, although associated with more than seventy-five per cent of water—in proportion to the carbonaceous residue or magma or solid part of the peat. Still our estimate of the phosphoric acid potash and lime indicated a money value of these elements alone in each tun of 2,000 pounds, worth $3·70, including the ammonia. After more than twenty years' experience in the analysis of soils and marls for others in Maryland, I now testify to the practical importance of such results on my own farm, having devoted my attention to it as a much more certain and profitable investment of my time and acquirements than the laboratory, although that was a success and decidedly so.

DAVID STEWART, M.D.,

Formerly Chemist of Maryland State Agricultural Society, etc.

Port Penn, Del.

To Put a Grain Mill in Order.

MESSRS. EDITORS:—ADJUSTING THE SPINDLE.—First see if the cock-head and spindle-neck be true; if not, take the spindle out and adjust it. Put the cock-head in a female center, in the dead head of the lathe. Turn the neck true, then run the neck in a suitable bearing. Gland the spindle to the face plate, run the dead head back, and true the cock-head with the center out.

FITTING THE DRIVERS.—Turn the runner or upper burr back down. Draw a chalk line through the center of the burr and through the center of the recesses in which the drivers work. Then draw another line (which we will call A) at right angles or square with the first line, passing over the center of the burr and cutting its circumference into four equal parts. Turn your spindle head downwards with the driver on into its place. Wedge the drivers hard up with hard-wood wedges on which it will press when running. Put on your jack or radial arm and file the pressing faces of the driver till the point in the jack stands equidistant from the face of the burr at both ends of the line, A.

LEVEL THE BED STONE true in all directions with a good spirit level. Put in your spindle and tram it true to the leveled bed stone.

BALANCING THE RUNNER.—If the back is much out of true it will look a great deal better to turn it. However, it can be balanced without turning. You can either face off your burr with sand and water and turn it while this is going on; or you can run the burr up about three fourths of an inch and put in two pieces of hard wood dressed true, 6 inches wide by ½in. thick. Bring your runner down nicely till it takes the oscillation of the burr without grinding the wood. After you have turned the back, take out the wood. See how much weight it will take, placed on the very verge of the back, to bring it to standing balance. Place the same weight on the same light side on the edge of the burr, down as near the face as possible. Run up to grinding speed; either mark the back with a pencil or the face with a lath dipped in red paint. If the originally heavy or opposite side now trails, move your band and balance a little nearer to the cock-head till you find the exact point where it will be both in running and standing balance. If, on the other hand, the light side still trails, or if the trail has moved to right or left, or "quartered," put more weight over the trail on the lower edge of the burr near its face, and exactly the same weight on the top or back of the burr on the opposite side of the circle, as much as will bring it to balance. It will then be in balance, standing, and at all speeds.

CONCLUDING REMARKS.—In order that the intelligent mechanic may know the theory as well as practice of balancing, let him fancy a pair of governor balls, one of wood and one of iron. The iron one will fly up to the horizontal line quicker than the wooden one; and suppose these balls are inverted (turned upside down), the iron one will come down quicker and press harder than the wooden one. From this it will be seen that the cock-head is the center of suspension for the balancing forces, and that you cannot put a burr in standing and running balance by operating on the back alone. You can put it in running balance at one speed, and then you can put it into standing balance on the neutral ground of the plane of the cock-head. JOHN W. HOPKINS.

Wilmington, Del.

Dualin, the New Explosive.

MESSRS. EDITORS:—I notice an article in the SCIENTIFIC AMERICAN, page 401, Vol. XXIII, in relation to the experiments made with dualin at the east end of the Hoosac tunnel, in which your correspondent wrongly informed you about the strength of it. Lieut. Dittmar, the inventor, brought 1,500 lbs. here Nov. 28th, which I used on our 8 ft. slope with good success. I have used over 1,000 lbs. of dualin here since Dec. 1st, and am confident that it possesses the full strength of nitro-glycerin, besides being perfectly safe for any ordinary blaster to handle. It will not explode by concussion, and can be tamped as hard as powder with perfect safety. I see no reason why it will not eventually entirely supersede common powder for all blasting purposes. H. G. HOLDEN,

Supt. east end of Hoosac Tunnel.

Dec. 30, 1870.

Why Mainsprings Break.

MESSRS. EDITORS:—On page 372, last volume, of the SCIENTIFIC AMERICAN, Mr. Henry Hollinshed, Jr., of Camden, N. J., attempts to solve the mystery of the breaking of mainsprings by stating that they are wound up too tight around the arbors, and that in this state contraction breaks them.

If Mr. Hollinshed is conversant with watches, he must know there is a stop attached so as to prevent the spring from even being wound tight around the arbor, or strained to its full capacity, and also to prevent its running down beyond a certain point. But it is a practice among watch repairers or

watch spoilers to forget to put these stops back after taking a watch apart, so as to get plenty of jobs in putting in new mainsprings. This is one of the radical causes of mainsprings breaking, as the spring is in that case sure to be overtaxed. Springs are also sometimes unequally tempered. In this case the weak point gets continually weaker until it finally breaks. Most generally this occurs soon after winding, because at that time the spring is strained most. C. H. PALMER.

New York city.

Something about Lavas.

Lava is seldom seen in a state of complete igneous fusion, but consists of crystals, or granules, in a fused paste, and its fluidity is, in a great measure, due to the steam with which it is permeated. The flows of lava vary very much in extent. We may quote two cases, in the first of which an area of fourteen miles by six miles was covered, and in the second an area of fifty miles by fifteen miles was covered to a depth of 500 ft. When we consider that the mass of liquid stone in the last instance far surpasses the magnitude of Mont Blanc, we may form some idea of the extent to which the face of the country would be altered, even by an ordinary eruption; and, in such a case as this, the lava would probably continue to flow for more than a year. Owing to the expansion of the elastic vapor in it, lava is often vesicular, or porous, and, when these vesicles, or hollows, are filled up by minerals deposited from the water percolating the mass the lava is called amygdaloid; and when single detached crystals are scattered through a compact base, or large crystals through a fine-grained base, the lava is known as porphyry, and the rock is said to be porphyritic. Lava, also, sometimes assumes a columnar structure, of which the well-known "Giant's Causeway," in Ireland, is a good example. Besides these formations lava is often forcibly injected into cracks in other rocks, forming what are called "dykes," or walls; the adjacent rocks are very much altered, both in form and construction, by the exceeding heat of the melted lava injected into them.

Igneous rocks, are without exception, composed of silicates of magnesia or alumina, and may be classified under three heads—Volcanic, Trappean, and Granitic. Volcanic rocks differ among themselves in being made up of different minerals; they also differ very much in texture. Some are crystalline (or granular), some compact, and some glassy. The mineral constituents of the granular rocks are easily determined by simple inspection, while those of the compact rocks may be discovered by chemical analysis.

Volcanic rocks, or lavas proper, may be classified under three heads—Trachyte, Dolerite, and Trachy-Dolerite. Trachytes are so called from the Greek word "trachys" (rough), because they have a rough, prickly feeling when handled. In appearance they are generally pale-gray or white, though they sometimes assume a dark-gray and nearly black aspect. They are composed principally of a feldspar, which is rich in silica, but the different varieties vary both in composition and appearance. The trachyte, properly so called, has either a fine-grained or quite compact texture, a harsh feel, and a cellular appearance. In color it varies from pale to dark gray, and is sometimes reddish, from the presence of iron. Of the many varieties of trachytes we will only mention two—Volcanic glass, which is the vitreous condition of a trachytic rock, resembling coarse bottle glass in appearance; and pumice, which is the cellular and filamentous form of the foregoing. Cellular pumice is dark-green in appearance, with less silica than alumina, while the filamentous is richer in silica, and white in appearance. Pumice is, in fact, the froth of lava, and although when powdered its specific gravity varies from 2 to 2¼, yet it will float in water, owing to its porous character.

Dolerites or hornblendic lavas are so called from the Greek word "*doleros*," deceptive. They are usually of a dark green or black color, becoming brown on the surface, when exposed to the weather. They are generally heavier than the trachytes, containing less silica, and more of the heavier hornblendic minerals. The dolerite itself is of a dark gray color, and of a granular crystalline structure; and besides the main ingredients, silica, magnesia, and alumina, a considerable proportion of iron and lime enter into its composition. The two chief varieties of dolerite are anamesite and basalt. Anamesite is only a fine-grained dolerite, so fine grained that its granular texture is only just perceptible. It forms the connecting link between dolerite and basalt, which is a compact and, to all appearance, homogenous black rock. It often contains crystals of hornblende and magnetic iron, and is sometimes vesicular or amygdaloidal. It is for this reason that the "Giant's Causeway," in Ireland, has sometimes been called an anamesite, though generally considered to be a basalt. The trachy-dolerites or, as they may be called, intermediate lavas, do not, from their very nature, admit of any accurate definition. They consist of an almost intimate mixture of the two foregoing species of rocks, the minerals of each blending together so that they can scarcely be distinguished. Besides these regular lavas or volcanic rocks, there is the volcanic ash, which consists of the ash mixed with fragments of lava ejected from the crater of a volcano during eruption. This so-called ash often greatly exceeds in bulk the streams of lava. A tract of country, with a radius of 25 miles, has sometimes been covered to a depth of ten feet, and the lighter ashes may be carried 600 or 700 miles by the wind. The degree of consolidation of these materials varies very much, and depends upon the circumstances under which they were ejected. Sometimes they remain loose, and sometimes form a solid rock. If they are ejected upon land, they may be consolidated either by their own weight, or in consequence of the percolation of water derived from rain falling with the ashes, or subsequently gaining access to them. As an example of this we may say that the ash which fell on Herculaneum was mixed with water, and is, consequently, much harder than that which covered Pompeii. If the ash falls into the sea, it becomes consolidated in a manner precisely similar to the mechanically-formed aqueous rocks already treated of, and often contains fossil shells.

Air Holes in Ice.

Mr. John Langton, of Ottawa, Ontario, in a very interesting communication to *Nature*, upon the "Prismatic Structure of Ice," thus speaks of the formation of air holes:

"There are also some curious facts connected with the air holes which form themselves during winter. There are often particular spots where partial openings in the ice will be formed every winter. These I conceive to arise from warm springs, and to have no connection with air holes, properly so called, which are not confined to any particular locality, but may appear anywhere. There is always a good deal of air under ice, and you may often see it scattered about in small bubbles when the ice is thin. It is probably air excluded in the process of crystallization, and when there is added to it sundry gases formed from decaying matter in the water, it amounts, during the winter, to a considerable quantity. Such collections of air, like the bubble in a spirit level, are in a very uneasy condition, and are rapidly transferred from one place to another on any casual disturbance of the level, giving rise to one of the numerous noises which are always, more or less, heard on a lake covered with ice—at least, we used always to attribute to this cause a peculiar groaning sound, which was very common. Now, if there should be any casual inequality in the lower surface of the ice, the air will naturally collect there, and if it is above 32° F., which, in so far as it consists of evolved gas, it probably will be, the receptacle will be increased by thawing. A dome-shaped cavity will thus be gradually formed, which will finally reach the surface; air will escape from below, and the surface water, of which there is almost always more or less after the snow has fallen, will run from above, wearing the little jagged channels, which are characteristic of air holes. The whole thing will then, after a while, freeze up again, leaving an indication of where the air hole has been in the different color of the freshly-formed ice. I have tried several such air holes with an axe, when first formed, and have always found them to lead to such a dome-shaped cavity. I remember, on one occasion, an otter frequenting a large air hole which remained open for some time, and which must have been from a mile and a half to two miles distant from the nearest open water. How did he reach it? for no otter can travel that distance under water without access to air. The Indians say they will go to greater distances still under the ice, and that they will always find air there. It is likely enough that there may be many such dome-shaped cavities, which have not yet reached, and may never reach, the surface as air holes, but one would imagine the air they contain to be not of the most wholesome character. However, this otter did frequent that air hole for about a week, which it certainly did not reach by traveling on the ice; and though it had few chances of breathing there, in the daytime at any rate, it contrived during that period to elude the snares of a white man and an Indian, who wasted a good deal of time in looking after it.

"So far, the process of the formation of air holes, if I am right in my explanation, is intelligible enough; but sometimes they are formed in a manner which is difficult to account for. Upon one occasion I had crossed the lake to a friend's house, about four miles off, and we had determined to start together next morning to our nearest town, but I had to go home first. I first went over by daylight, when there certainly was nothing unusual in the appearance of the ice, which might be four or five inches thick at the time, with a slight sprinkling of wettish snow on it. I returned home about eleven at night, and, as it was bright starlight, with only a few floating clouds, I should have noticed any change; but I came straight across, and saw nothing to attract attention. But when I crossed again at daylight in the morning, in one part of the lake the whole surface was covered with air holes; there must have been hundreds of them. At first I gave them rather a wide berth; but, on approaching one to examine it, I found it frozen up again, the clear ice in the hole, with very slight indications of the characteristic jagged edges, being the only sign that there had been an open air hole there during the night. I had no axe with me to try whether they were connected with any cavity, but the appearance was as if holes of from two to five or six inches in diameter had been punched through the ice. Of course, we attributed it to electricity, as people will do anything which they do not otherwise understand, and I have never been able to give any more intelligible explanation of the phenomenon. There certainly had been some faint sheet lightning that night, a very unusual thing in winter; but what connection, if any, there may have been between the two things, I cannot say."

Method of Searching for Diamonds.

There is little doubt that diamonds exist in many places as yet unknown, or where their presence is unsuspected. Gold is discovered readily in auriferous regions, even by those who are inexperienced at the work, but the diamond is far less easily detected. It is very difficult for the unpracticed eye to distinguish it in its natural condition from crystals of quartz or topaz. One, therefore, who has no experience in diamond seeking may see, and even handle, such gems without recognizing them or even suspecting their value. It was in consequence of the geological knowledge of Humboldt that the diamond regions of the Ural Mountains, in Russia, were first discovered. At his suggestion the gold washers were directed to search for diamonds before they had been found or any suspicion raised of their existence. From that time to the present the finding of diamonds there has become frequent.

The color of the gems constitutes the main difficulty in detecting their presence. They, in fact, are of various shades and hues, as yellowish brown, green, blue, and rose-red, and very closely resemble the common gravel by which they are surrounded. The finest, however, are of no color at all, and are to the inexperienced diamond seeker identical in appearance with transparent quartz crystals.

In Brazil, where great numbers of diamonds, chiefly of small size, have been discovered, the method of searching for them is to wash the sands of certain rivers in a manner precisely similar to that employed in the gold fields of Australia; namely, by the aid of prospecting pans. A shovelful of earth is thrown into the pan, which is then immersed in water, and gently moved about. The result is that the contents are converted into a kind of thick, muddy slush, from which the stones are picked out by the hand. As the washing goes on the dirt and sand are gradually disposed of, and the pan contains apparently only about a pint of thin mud. Great caution is now observed, and ultimately there remains only a small quantity of sand. The diamonds and particles of gold, if haply they are present, sink, by virtue of their great specific gravity, to the bottom, and are selected and removed by the practiced eye and hand of the operator. But how shall the gems be detected by one who has had no experience, and who in a jeweler's shop could not separate them from quartz or French paste? The difficulty can only be overcome by testing such stones as may be suspected to be precious. Let these be preserved until the day's washing is over, and then tried by the very sure operation of attempting to cut with their sharp corners glass, crystal, or quartz. When they are too minute to be held between the finger and thumb the specimens may be pressed into the end of a stick of hard wood, and run along the surface of a piece of window glass. A diamond will, in such case, make its mark, and cause, too, a ready fracture of the glass in the line over which it has traveled. Tested in a similar way upon a crystal of quartz the diamond will make such an impression as no one crystal can have upon another. But a yet more certain and peculiar characteristic of the diamond lies in the form of its crystals. The sapphire and the zircon will readily cut glass and scratch quartz, but they have not the curved edges of the diamond. In small crystals this peculiarity can only be observed by using a magnifying glass, but it is invariably present in the true gem, whether it be large or small. It is, perhaps, rare to find a diamond with four curvilinear faces, but such a circumstance places its identity beyond the domain of doubt. Another form of diamond is that of the octahedron, or eight-sided solid, with the edges replaced by interrupted narrow convex surfaces. Such interrupted, convex, or rounded angles are sure indications of genuineness. The diamond breaks or is scratched with difficulty, and hence a test sometimes employed is to place the specimen between two hard bodies—as a couple of coins, for example—and force them together with the hands. Such a pressure will crush a particle of quartz, but the diamond will only indent the metal. Thus much of practical information for the service of the diamond hunter of the Cape; and now, supposing a successful issue to his exertions, let us say a word or two as to the mode of estimating the value of diamonds. They are invariably valued by the carat, which is four assayer's grains. The estimate is made by squaring the number of carats, and multiplying the result by the price of a single carat. The price, it will thus be seen, increases in a multiple proportion to the weight. The actual price of a small, rough diamond, fit to be polished, is about £2 per carat. One of two carats is worth, therefore, $2\times2=4\times2=$£8; one of four carats, $4\times4=16\times8=$£128. The value increases by both size and color—or water, as it is termed.

When diamonds are cut and polished they are known to jewelers as brilliant, rose, and table diamonds, depending on the form and number of the artificial faces. Diamond cutting is chiefly done in Holland, on wheels of iron or copper, and with the agency of the dust of inferior diamonds, known as diamond dust. A set diamond may be tested by placing wax on its back. The luster of a true gem will not be affected by this operation, while the spurious brilliancy of paste imitations will be totally destroyed by it.—*Mechanics' Magazine.*

Unhealthy Foundations for Buildings.

Two learned doctors, says the New York *Mercantile Journal*, have disagreed (a thing not unprecedented in history) in regard to the cause of the recent unhealthiness in Liverpool. Dr. Stallard, who has made a report on the subject, attributes it to the filling in of the brick-pits with refuse, consisting of ashes, fish bones, lobster shells, cabbage leaves, potato parings, old door mats, broken pottery, and other things, too numerous, as well as disagreeable, to be mentioned, which the drainage of the sewers will not remove. He affirms that no house can be healthy built on such a sub-soil, and that sewers must inevitably be filled with noxious gases, so long as such a state of things exists. To whom Dr. Trench opposes the opinion that, as a physician and chemist, he sees no reason why the materials named should not, if left undisturbed, be decomposed without the evolution of noxious gases, to any injurious extent, and the products of decomposition become a good and firm, though porous foundation; the latter quality rendering it a more healthy foundation than the clay upon which the greater part of the city stands. The Health Committee of the city, in view of these conflicting opinions, have resolved to refer the matter to Professor Huxley, requesting him to name two competent scientific men to investigate the matter thoroughly. The report which will be made will be looked for with interest, as this is a sanitary question of the first importance to all cities.

Improved Steam Gage.

On page 375, volume XXIII., of the SCIENTIFIC AMERICAN, in an article headed "Safety *versus* Economy in Steam Boilers," we expressed our opinion that "unsafe boilers should be legislated out of the market, if possible," etc. Since we thus wrote, the daily journals have given accounts of several sad disasters from "Boiler Explosions," on land and water, which are doubtless to be attributed either to imperfect construction, or to the unfaithfulness or incompetency of employés—provided the owners themselves were not in fault, from unworthy pecuniary considerations. Not seldom do the latter force their employés to use apparatus which they know to be extra hazardous, or of the safety of which, at least, they have no assurance. We feel justified in the inference that the party who sells and the one who buys a boiler second-hand, for one fourth its first cost, cannot be ignorant of the probable existence of defects from which serious consequences may result. If, however, they persist in the use of such boilers, they endanger lives and property criminally.

We also stated in the article alluded to, that it is somewhat difficult to frame a law the enforcement of which would secure proper care in the attendance of boilers, and their usual attachments, or to conceive any system of legal inspection which would be sufficiently stringent with one class, without having conditions that would be onerous in their bearing upon others.

Such being the case, we must look for some mechanism to be used in connection with the various adaptations of steam, both as a power and in its general application as a vehicle for transmission of heat, which will afford greater security to the public against foolhardiness, presumption, ignorance, and irresponsibility.

Pertinent to this subject, we present to our readers an illustration and description of Edson's Recording Steam Gage, an invention which received the first premium at the late Fair of the American Institute, and which seems to meet a long-felt want. This instrument will doubtless be as fully appreciated in its practical use as it already has been in anticipation. We have evidence that the charts, or steam-written "logs" it affords, are considered by the life, fire, and marine underwriters, as reliable vouchers of the care exercised by those in charge of steam, and that they consequently are valuable to them in determining risks which they assume. If, as is claimed by the inventors (who have been several years secretly perfecting these steam gages, before submitting them to public inspection), these instruments shall prove to be more reliable for accuracy in denoting the steam pressure than the gages heretofore used, in addition to their recording features, users of steam will not fail to discriminate in their favor. A watchman of this kind will supervise machinery and workmen with more fidelity than many a living watchman. An alarm gong is continuously sounded when any limited pressure is exceeded.

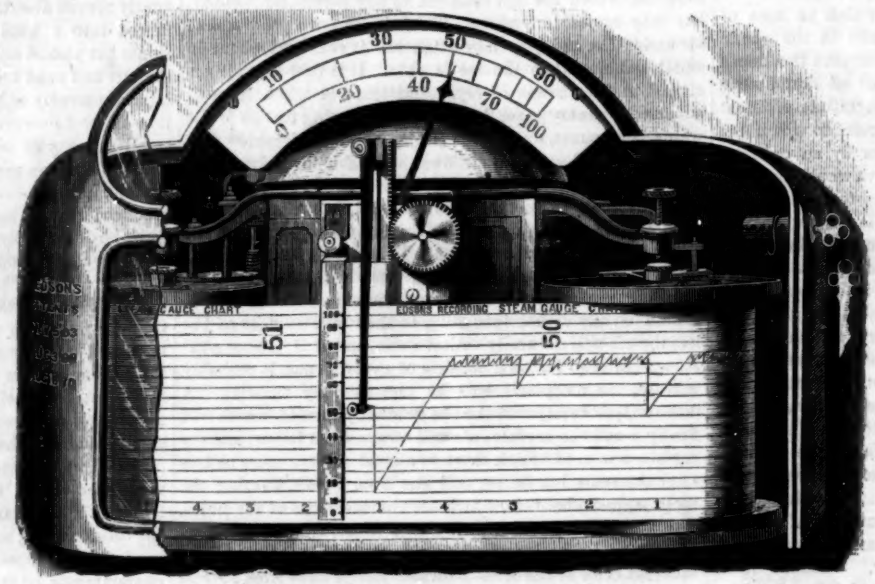
One of the charts will last for several months, and portions may be removed from time to time and filed away for future reference. The cut needs but a brief description. The steam enters by an ordinary pipe coupling into a series of circular, horizontal chambers, placed behind the pencil bearing, and by expanding, the former is made to operate the gear, causing the pencil to move upward in proportion to the degree of steam pressure, and ringing the alarm when the previously fixed limit is reached. The reverse movement of the gear, produced during the reduction of pressure, moves the pencil downwards, simultaneously with the rotary motion (given by means of a horizontal rack and lever operating a pawl within the upper rim) of the receiving drum, and, in consequence of the motion thus given to the chart, the pencil is made to trace an oblique line, invariably in proportion to the fluctuation or reduction of pressure. A vertical line always denotes degrees of increasing pressure.

The chambers consist of pairs of corrugated steel disks, each disk, as well as the other motive parts, being nickel-plated, to prevent them from corrosion, even in a saline atmosphere.

The vertical scale is placed at the left of the pencil, as a guide for the chart; also for greater convenience when marking the pressure upon the chart, previous to its removal. The charts are divided into sections, numbered consecutively "50," "51," etc., the sections being sub-divided into four parts, marked 1, 2, 3, 4.

The instrument is secured with a combination lock, and may be placed in the cabin of a steamer, or office of the commander, as well as in an engineer's or superintendent's room, when required. It is adapted to locomotive, stationary, and marine boilers, of high or low pressure, and to any vessels sustaining internal pressure, as gas receivers, stills, soda fountains, etc.

It was patented in the United States May 5, 1868, Aug. 3, 1869, and Aug. 16, 1870; also in several foreign countries. Manufactured and sold solely by "The Recording Steam Gauge Company of New York," 91 Liberty st., New York.



EDSON'S RECORDING STEAM GAGE.

A Queer Capture of Telegraph Apparatus.

At Manheim there is on exhibition a telegraphic apparatus, taken from the French, which is to be sold for the benefit of the captor. It was obtained in the following manner: A certain dragoon of the Baden Guards, by name Muench, with two of his comrades, was sent to reconnoitre as far as the Vosges. They had to pass through the village of Raon l'Etampe, the simple inhabitants of which place had not, as yet, seen any Germans. On the entrance of the three armed dragoons they fled in every direction, with the cry of "The Prussians! the Prussians!" and shut themselves up in their houses. Thus left masters of the town, the dragoons, coolly smoking their cigars, rode to the Town Hall and summoned the *Maire*. He soon came, pale and trembling. They asked him where the Telegraphic Bureau was located. He pointed it out, and they at once went to it, and Muench singly, and in the presence of the assembled City Council, cut the wires, unscrewed the apparatus, and buckled it on to his horse. The three dare-devils then coolly mounted and rode away. The commandant of the place, on learning what had happened, declared that he could not survive the dishonor of having commanded in a town of 8,000 inhabitants, where three of the enemy's men were allowed to enter and work their own will, and shot himself dead on the spot. The apparatus is worth about 600 francs, and was presented to Muench, on his return to camp, by his commanding officer.

MERRIMAN'S IMPROVED WATER-PROOF DRESS AND LIFE PRESERVER.

The accompanying engravings represent C. S. Merriman's patent water-proof dress and life preserver ready for use, and a detail of the same.

It consists of two parts; namely, pantaloons and coat joined at the waist, so as to be water-tight, by means of a metallic ring and elastic rubber bands, as shown in Fig. 2.

The coat is provided with a hood, which covers the head, leaving an aperture about the nose, eyes, and mouth, which is surrounded by a band of elastic india-rubber.

The neck of the garment is made of a size sufficient to allow the head to pass up through into the hood, which has a lining extending down the back of the neck in such manner as to form an air chamber. When unfolded the air chamber presses upon the back of the head of the wearer, causing a tendency to push the head forward out of the opening, and causing the flexible rubber to be drawn smoothly and tight about the faces so as to exclude water from pressing in.

The front and back of the coat are also lined, and are inflated by means of the tubes shown. Vertical partitions in the middle of the front and back of the coat, and also at the side seams, divide the space between the outside of the coat and the lining into four air chambers, besides the one at the back of the head. The sleeves terminate with rubber gloves, as shown.

The bottom of the coat is provided with an elastic rubber band, three inches wide, and one sixteenth of an inch thick. The inside and lower edge of this band for a width of one inch is left three sixteenths of an inch thick, with the projection on the inside, and square shoulders at the top, as shown in the detail.

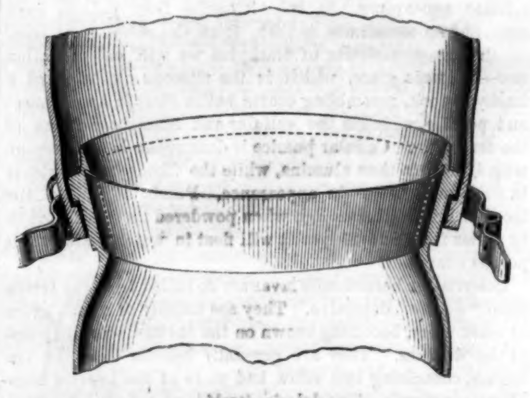
The pantaloons are provided with a ring or band of metal or other rigid material, sufficiently large to pass over the hips of the wearer. Said band is made flaring, with the large side up, and is put between the inner lining and outside material at the top of the pantaloons. A rubber band, two and one half inches wide and one eighth of an inch thick, is then drawn smoothly about the first even with its upper edge, and all firmly cemented together.

The pantaloons are lined down to the knees, and are in- flated by means of rubber tubes which pass in at the pockets. The lower portions of the pantaloons terminate with tight boots.

When the coat and pantaloons are joined together, the bottom of the former is drawn over the top of the latter, so as to have the thicker portion of the rubber band on the coat below the thicker portion of the similar band on the pantaloons. The joint then forms a dovetail or lock-joint, as shown in the detail. The whole is now secured by means of a strap buckled tightly over the joint. The strap is secured in its place by small loops or thimbles placed at intervals about the rubber band of the coat.

On the 18th day of October, 1870, the inventor, as we learn from a Western exchange, swam and floated fully three miles in the Missouri River in presence of many spectators. The water was very cold, ice having formed a quarter of an inch thick the night before. On coming from the water he found himself perfectly dry, warm, and comfortable. On the 19th day of December, 1870, he gave an nexhibition off the Battery, at New York, with equal success, which exhibition we had the pleasure of witnessing, and from which we formed a very favorable opinion of the usefulness of the device as a life-preserving apparatus.

The dress is convenient to carry, weighing only from ten to fifteen pounds, and when folded, being easily packed in a carpet bag. It can be put on and adjusted in from two to three minutes, and when properly put on excludes the water perfectly. When the dress is fully inflated the body is surrounded with a stratum of air, and lies with the utmost ease upon this elastic cushion. The non-conducting property of this layer of air, and the material of which the suit is made,



keeps the body warm even in a very cold atmosphere. The body floats about one third above the surface, and the head rests on the elastic pillow formed by the inflated hood. We judge from the experiment we witnessed, that, under favorable circumstances, a man in this dress could swim from two to three miles in an hour without exhaustion.

Patented in the United States, August 10, 1869, and subsequently patented in most of the foreign countries through this office. Communications may be addressed to the inventor, Mr. C. S. Merriman, 363 Broadway, New York.

THE lessons of the war to surgical science are beginning to be published. One of the most remarkable facts made known from the hospital reports is that the French soldiers have suffered more from the Prussian shells than from the needle gun and bayonet combined. This is contrary to usual experience, which has reckoned artillery more powerful to frighten than to harm; but it agrees with Napoleon's reported remark to King William at Sedan, as to the marvelous precision of the German cannoneer. It is also said that the needle-gun bullets, though larger than those of the chassepot, do not penetrate the flesh so far, and so make less serious wounds. The sword bayonet used by the French is a much more savage weapon than the old-fashioned triangular blade, which is still retained by the Prussians. Shell wounds are generally found to heal very easily if no bones are fractured

IT is said that in the Antarctic seas there are sea weeds which have stems about twenty feet high, and with a diameter so great that they have been collected by mariners in those regions for fuel, under the belief that they were driftwood. They are as thick as a man's thigh.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE NEW COMMISSIONER OF PATENTS.

The President has appointed GENERAL MORTIMER D. LEGGETT, of Zanesville, Ohio, U. S. Commissioner of Patents. He will enter upon his duties immediately upon being confirmed by the Senate. A short notice of the new Commissioner was published upon page 9, No. 1, of the new volume.

THE PROPOSED FAIR OF THE AMERICAN INSTITUTE IN 1876.

The proposition to hold a grand International Exhibition in New York city, under the auspices of the American Institute, in 1876, on the occasion of the centennial celebration of the birth of our Republic, has long been entertained by the Board of Management, and now seeks tangible shape in a memorial to Congress and a circular addressed to whom it may concern.

The occasion selected for this grand project is very appropriate, and must at once challenge the support and insure the sympathies of all patriotic citizens. We hope that something worthy of the country, and in keeping with the high reputation of the Institute, will be accomplished. Before entering upon a plan of this magnitude it will be well for the managers to agree upon all the details, and to count the cost.

We had occasion, recently, to speak of the importance of scientific administration and to deplore the lack of this potential energy in the public and private affairs of our country; and we are forcibly reminded of this topic when we contemplate the immense undertaking the Institute has proposed to itself. Without rare administrative ability and the services of the best talent of the country, the exhibition is certain to be a failure, and we cannot contemplate its inception without great misgiving.

In a circular, prepared no doubt for the information and instruction of Members of Congress, entitled, "The American Institute and its Mission," we find an interesting account of what the society has accomplished towards the encouragement of American industry. It appears that thirty-nine National Exhibitions of the products of our own country have been held since the foundation of the Institute in 1828.

These fairs had small beginnings but they have shown a steady growth, and the last one was the best of all. Considering the limited means at their disposal and the want of a suitable building in which to hold their exhibitions, it cannot be denied that the managers have produced results very creditable to their administration and full of encouragement for the future. The award of prizes, medals, and diplomas, by juries of competent men, has had the effect to stimulate the ingenuity, arouse the emulation, and encourage the competition of inventors, manufacturers, and producers in every branch of industry and the arts. The officers of the Institute have shown themselves able to grapple with an American Fair, and they may possibly be equally successful in the broader field of an International Exhibition. It is upon this latter point, however, that we shall presently have something to say.

The circular speaks of the valuable scientific library of ten thousand volumes, to which the members of the Institute have free access; and of the four clubs now in full operation, he proceedings of, which have an enormous circulation throughout all parts of the Union. The American Institute enjoys the rare privilege of having its transactions published at the expense of the State of New York, and in this way the information furnished by the sections is preserved in book form, and can be consulted in every public library of the country. There is no other society in the United States whose proceedings are so extensively read, and in this respect it challenges competition.

We understand that the Institute has in real estate and government securities property of the value of three hundred thousand dollars, and this amount is now steadily increasing from the proceeds of the annual fairs and the interest on bonds. The society makes a brilliant show in the extent of its property and the good it has accomplished. It now becomes a grave question whether it is wise to endanger the estate or risk the usefulness of the American Institute by entering upon a scheme of such proportions as is indicated in the circular.

The hundredth anniversary of our independence can be celebrated by the Institute without an appeal to Congress. It is the obvious duty of the citizens of New York to put up a suitable building for annual fairs and permanent libraries and collections. It is an unspeakable diagrace to us that such an edifice has not long since been constructed and filled with models of machinery and specimens illustrating the material wealth of our country. Congress must not be asked to make any grant for the purpose and ought to refuse it if they are asked. The American Institute can stand on its own merits. If the citizens of New York will not believe in it, Congress cannot help the matter. The first thing to be done is to secure a site and put up a building. The plan of a World's Fair ought at once to be abandoned. There is not land enough to spare on the island of New York, and not sufficient money to put up a building large enough to hold type specimens of the industry of all nations.

The Paris Exposition of 1867 was the last and best of its kind. We shall never see anything like it again. The building covered forty acres of land; the park outside embraced eighty acres more, and there was an island of fifty acres in the river Seine set apart for agricultural implements. There were fifty thousand exhibitors, and the money value of the articles in the Exposition was estimated at one hundred million dollars. And yet in the face of all these statistics the circular says:

"In the hands of the long-tried and experienced management of the Institute, the World's Fair of 1876 will, without doubt, eclipse those of the Old World." The committee who have the matter in charge would do well to follow the example of the English Commissioners, many of whom had served in 1851 and 1862, who, when the question of another World's Fair, in 1872, was proposed, unanimously decided that such a project, in the present age of industrial progress and invention, was impossible, and they have changed the whole plan of decennial fairs into annual exhibitions of specific objects.

The true plan for the exhibition managers of the American Institute, is, therefore, to profit by the teachings of the English Commissioners, and to abandon the idea of an International World's Fair. They will be much more likely to obtain money from our citizens when they ask for a million dollars, than when they come before the public with plans involving an outlay almost as great as the cost of the Pacific Railroad.

MECHANICAL POWER.

We have often been obliged to correct errors in thought arising from the fact that many of the words used in scientific discussion still do double duty, retaining not only the meaning formerly attached to them in the times when knowledge was comparatively imperfect, but being also used to express ideas obtained through more modern research.

The term "power" is such a word, and perhaps no other in the language leads to greater confusion in thought among those who have not made the sciences of physics and mechanics special studies. It is with the intent to give clearer notions of the proper use of this term that the present article has been written.

In its primary philosophical significance the word power means ability to do any act of volition. In this sense the idea of power is connected with that of will, but the original meaning has been extended to the conditions of change in things animate as well as inanimate. When the conditions necessary for a given effect exist in connection with any body or mass of matter, we say that body has the power to produce the effect. Thus we may say a magnet has the power to raise a given weight of iron, etc. In a passive sense we also use the term, in such expressions as "the retina has the power to receive impressions of external objects." In the general sense of the term, then, power may be defined as ability to cause change, or the ability to be changed, whether the change be the motion of a mass, or the motion of molecule in a mass, or a change of state or condition (if there be any such), which we cannot attribute to motion of matter.

In the mechanical or dynamical sense, however, the word change in the definition of the term power is limited wholly to change of position in masses, or *mass-motion*, and the heat produced by friction. When we speak of overcoming resistance we are only using an expression which means the production of increased motion in masses of matter, or portions of masses, and the molecular motion of heat caused by friction. A vessel sailing through the water has three elements of resistance after attaining its maximum speed, namely, the displacement of water, the displacement of air, and the friction of the air and water upon its surface.

In a static sense the word power is popularly used to express the "tendency to produce motion;" or, in other words, it is used as synonymous with force in ordinary language.

In mechanics, even by some eminent writers, the term is used not only in a general sense as ability to produce motion, or to perform work, but, in a specific sense, as ability to do some particular work under particular circumstances. In this sense it is used in the old saying, that "what is lost in speed is gained in power, and what is gained in speed is lost in power." This is only true when the word power is used in a special sense. In this sense an engine that would pump a ton of water to the hight of fifty feet in one hour, by a succession of impulses, might be entirely insufficient to raise it as a mass, unless a train of wheels or other device be employed to "change speed into power." Yet the power of the engine to perform work is the same in both cases, when the term work is understood in its general sense, as measured by the number of foot-pounds of resistance overcome per minute of time.

We think it is much to be regretted that the use of the word "power" is not restricted in mechanics to its dynamical meaning. Its use as a synonym for force is liable to mislead the mind and cause confusion on points of mechanical science requiring the utmost clearness of conception.

The term "mechanical powers," as applied to the elements of machines—the wheel and axle, inclined plane, lever, etc.—is singularly inappropriate, and has been discarded by some of the best writers on mechanics. No one of these elements is a mechanical power, in any just sense of the term. It is only by the addition of other circumstances that they even become instruments for the transmission of power.

The want of clear conceptions of the distinction between the meaning of the term power, when used in its dynamical sense, and the term static force, or pressure, has led to more absurdities than any other error in mechanical science. Some of these absurdities are apparent in the series of articles on "Perpetual Motion," now appearing in this journal.

OBJECT TEACHING AND SCIENCE.

The public are beginning to be awakened to the fact that technical education is *the* education they require, being in accordance with the conditions of modern civilization; and it is admitted that such technical education must be based upon a foundation of natural knowledge. The principles of the natural sciences must then, for the future, form an essential part of popular education; the only questions are, how far and in what manner are these sciences to be introduced? Whatever is to be the amount taught, educators are agreed that the first steps in natural science, or, in other words, in systematizing natural knowledge, are to be taken as early as possible. Early impressions are the deepest, and every child before its school days is already an untrained student of nature. The foundations of technical education should, therefore, be laid in the primary school; but whether commenced thus early or not, the method will always be the same. The child must be encouraged and guided in its natural habits of observing, and it must be led to systematize its observations, connecting them together by a chain of reasoning into groups of related ideas. This method is simply that known as "object teaching;" and you may as well try to fly without wings, or to teach geography without maps or globes, as to teach natural science without objects and diagrams. There is not a teacher, now-a-days, but has heard of this object teaching; there are hundreds who have tried to utilize it; there are "colleges" in which it is professedly taught as a system; and yet there seems to be no method applied to the inculcation of natural science more misunderstood than this, and no teaching in our schools, at present, more utterly destitute of good results. Ninety-nine out of a hundred who talk so glibly of object teaching, forget that it is merely a method—a method that has for its end to inculcate knowledge; that this knowledge to be inculcated is the essential part of the lesson; and that a *thorough acquaintance with the subject must precede any application of this mere method of instruction*. To stand up and give a lesson upon a cat, without knowing the first principles of natural history, is simply to go through a farcical parody; and authorities who have no better conception of the purposes of object teaching than this, set the cart before the horse; or, rather, they never hitch on their should-be-useful animal at all, but ride off upon this hobby, leaving the load of knowledge it was meant to draw standing in the ruts—where it has been standing, as Professor Huxley admirably puts it, ever since the days of ancient Rome.

It has been recently advocated that every public school should be supplied with a collection of objects to illustrate the fundamental facts of natural science. By all means let it be so; but let the first use to which these are put be to instruct the teachers themselves in what they will have to teach. Let them learn what there is in each object of educational value, and what are its worthless characters; let them recognize that no object is complete in itself, but is merely a part of a vast whole, and that their office is to lead the child to recognize its most important relations to other objects. In building up the edifice of knowledge, they must not use every rough stone indiscriminately, but they must teach the little builders to chip off the useless angles of selected pieces, and so shape them that every stone shall, at its proper time, fit into its proper place. If this be not done, the most instructive objects in the world will not raise a single line of substantial structure, but will rest upon the minds of the pupils as an unarranged heap of meaningless facts—facts which will not even be long remembered; and it is as well that they should not be, because utterly useless, being unconsolidated by any cement of reason.

We fear that no better end is attained by, or can be hoped for from, object teaching in our public schools, until, as we have said, the teachers themselves are thoroughly educated in the principles of natural science. To accomplish this, however, the ear of those who rule the teachers must be gained; and we raise the question whether the representatives of science should not have a voice in the management of our public school system? As object teaching is a mere handmaid of science, is of use only to give scientific habits of thought, and to convey a knowledge of scientific facts, and is worthless without science, the public should see that

its introduction into our schools be carried on under the advice of scientific experts, who shall direct what is best to be taught, and advise with the adepts in teaching how such knowledge may best be imparted. As a journal having the interests of science and education at heart, desiring to see science soundly popularized, and the masses made acquainted with its technical value, we make this suggestion, and furthermore ask: Is there any man of scientific attainments in the present Board of Education? Is there any scientific authority upon its general staff? And how many teachers favorably known to and having the confidence of the really scientific portion of the community are engaged in giving scientific instruction in our public schools?

SOCIAL SCIENCE.

Science, in the philosophical meaning of the term, is a collection of the general principles and facts relating to a subject, arranged in a systematic form. We do not, however, consent to apply this term to a collection of facts and deductions until the accumulation comprises the leading facts possible to be collected by the application of proper scientific methods. One would only be laughed at for styling ancient alchemy a science, though it was the beginning of one of the noblest of modern sciences. Facts, to become the proper basis of science, must be examined with careful scrutiny to exclude all which is only *seeming* fact, and to be sure that nothing creeps into the category incapable of demonstration.

A series of assumptions may form the basis of a beautiful system, but it is now universally agreed that assumptions are inadmissible where experimental knowledge is attainable. But experimental *knowledge* is only attained by well-conducted, accurate experiment. When a lad, the writer performed a series of experiments with some heterogeneous chemicals, culled from a quantity of old jars and bottles, without labels. He gained only the knowledge that such crude experiments are very dangerous, and gained it at the expense of a burned face and some other personal damage. Doubtless many interesting and important facts might have been demonstrated by the proper use of the substances referred to; but, in the hands of the inexperienced and unskillful, they were only capable of jeopardizing life and limb.

The history of the human race is spotted all along with results of just such crude experiments. At present, we are trying numerous social experiments on a grand scale. An explosion has just occurred in Europe which has cost two countries great bloodshed and misery. We ourselves recently came near to destruction by an explosion, the wounds of which will not be healed in half a century, and our experiment is not yet ended, nor by any means free from the liability of future disaster.

Looking over the history of mankind one may well ask, where are the carefully ascertained facts on which to build social science? Who were the master hands whose efforts demonstrated these facts to the world? If social science, properly so called, is a future possibility, is it, from the nature of the case, a *present* possibility? And are the so-called systems, for which their authors claim the proud name of "science," really worthy of the name?

In looking over a volume which has lately found its way to our table, and which purports to be a treatise on Social Science,* we find much which gives a negative answer to the questions we have propounded. We find a negative answer, also, in the proceedings of so-called "Social Science Associations," and conventions, which contain little but disjointed theorizing upon assumed facts. We find a negative in the *status* of modern society in which suffering and misery are predominant, and much of which results directly from social organization. Mr. Carey, whose larger work—somewhat clumsily (we think) condensed by a female writer—forms the substance of the treatise under review, has acquired considerable reputation as a strong and fearless defender of the system of protection to American industry, and as a writer on political economy. His work entitled the "Past, Present, and Future" entitles him, in the opinion of the editor of the volume under review, to be called the "Newton of Social Science,"—a proud title, indeed, were it fitly applied. A comparison, however, between the labors of the two men, so far as Mr. Carey's socialistic speculations are concerned, will show, that where one took his points of departure from experimentally demonstrated and carefully ascertained facts, the other has made his deductions from the crude facts, the results of the turmoil of the jumbled elements of human society, as they have rushed together under the guidance of no directing mind.

Nor is Mr. Carey, in our opinion, free from the charge of building symmetrical theories, and regarding them as resting upon solid foundations, simply because their exterior presents a harmonious and firm appearance. Certain it is that his views have been strongly opposed by those who would have been convinced, had his system approached the demonstrative character of a science.

On page 27 of the work under review, we find the following paragraph:

"Seeking now to understand the history of man in past ages, or in distant lands, we must commence by studying him in the present; and having mastered him in the past and present, we may then be enabled to predict the future. To do this, it is required that we do with society as does the chemist with the piece of granite—resolving it into its several parts, and studying each part separately, ascertaining how it would act were it left to itself, and comparing what *would be* its independent action with what we see *to be* its societary action; and then, by help of the same law of which the mathematician, the physicist, the chemist, and the physiologist avail themselves—that of the composition of forces—we may arrive at the law of the effect."

Now, we ask, how we are to ascertain what the "parts" would do when left to themselves? Have they ever been so left, or, if they have, has their action been studied by those competent to study, and recorded by those competent to record? Does history show us any record of man except in some sort of social organization, possessing in itself the evidence of its unscientific structure? Surely, then, the action of the "parts" isolated must be assumed, unless we are to isolate them and experiment with them, as we do with the components of granite. No chemist ventures to predict what will be the properties of the components of a substance. He first separates the elements and applies to them rigid tests, to gain the knowledge he seeks.

Those who seek to frame a social science are in a position precisely similar to that of a man who should seek, by the aid of a book of ancient alchemy and a collection of animal, vegetable, and mineral substances, to create a science of chemistry. History teems with lies. To sift its truth from its falsehood puzzles the profoundest minds. It is plain that it is not a reliable guide in the construction of a system to which the name of science can be appropriately applied. All the experiments in social organization, even approximating to the rigid conditions which make experiment of any value, are found in social organizations like the Oneida Communists, and others of a somewhat similar character, and these are so few, and are accompanied by such palpable errors, as to exclude them from the pale of scientific investigation. Where, then, are the data? From what are the general principles to be evolved on which to build a science? In all attempts of the kind we have met, the principles are assumed, and the facts culled from the imperfect records of the crude experiments in association found in history. The book before us is not an exception, and though it is written in a vigorous style, and embodies much thought which is suggestive and instructive, we see nothing which entitles it to the name selected for it.

We have before avowed the belief that at present, at least, social science is not possible, and have entertained the doubt that the future will ever bring about a state wherein the elementary principles and facts necessary for such science will be obtainable. We may be in error in this opinion, but if so we are not alone in our mistake. We do not, however, on this account, deprecate the study of social organization, or political economy. We only wish to caution the student against mistaking assumptions for facts, and mere theories for the enunciation of principles.

* Manual of Social Science. Being a Condensation of the "Principles of Social Science" of H. C. Carey, by Kate McKean. Philadelphia: Henry Carey Baird, 406 Walnut street.

THE FAILURE OF THE HON. OAKES AMES.

The recent failure of the Hon. Oakes Ames has made quite a stir in business circles. An instructive moral may be drawn from it.

According to the Springfield *Republican*, the legitimate business of Mr. Ames and his brothers was never in a more prosperous condition than at the time of the failure. The profits of their shovel factory is estimated at $1,000 per day, and the Ames Plow Company's business was also going on profitably and smoothly. The journal quoted says:

With the success of his first investments in railroad building in Iowa and in the Union Pacific Railroad, and the great power which such vast enterprises brought back to him, there grew up in Mr. Oakes Ames a real passion for gigantic operations among the material forces of our civilization. It came to be so strong that, as he once confessed, he could not resist the fascination of a brilliant opening for connecting States or cementing continents with railroads, founding a city, or reconstructing social order, with great money gains behind it. He had still on hand large railroad operations in Iowa and in the South; the Mobile and Chattanooga Road was under his patronage; he was a prime party in an organization for reviving and completing a new railroad from the Potomac across Virginia to the Ohio River; and his real estate investments were numerous and large in all parts of the country. The consequence was, of course, an ever-increasing mountain of debt. Every new scheme locked up more and more means; they gave him great values—a wealth of lands, bonds, and stocks—but from which he could not realize at present; and so he came to be a borrower for millions, and needing, for fresh investment and to renew falling notes, new loans of $50,000 to $100,000 daily. Naturally, lenders became distrustful, and he had to pay higher interest. He found it more and more difficult and expensive to borrow, and only some untoward circumstance has been wanting for many months to close the market against him. This came doubly in the suspension of Mr. Treadwell, of San Francisco, the great dealer of the Pacific coast in agricultural implements, owing the Ameses, as reported, hundreds of thousands of dollars, and in the decision of Mr. Boutwell and the Attorney-General, backed by public opinion, against the impudent demand of the Union Pacific managers, that the Government should put its bonds and their interest back of their own income and land-grant bonds and stock—in effect, to surrender the Government claim to them entirely—which impaired the market for all Union Pacific securities, of which Mr. Ames is still naturally a very large holder.

Now, in these facts is contained a lesson well worth pondering. The greed with which men seek to amass colossal fortunes, and the impatience of delay in the realization of their ambitious schemes, are characteristics of American business men, which have become vices. The old avenues of trade by which their fathers secured fortunes, and were able to keep them when obtained, are too slow for the average American of to-day. Gigantic risks are unhesitatingly assumed if they offer a chance of rapid accumulation. The spirit of speculation has possessed the commercial public, and men stop at no means, within the limits of the law, to hasten their progress towards wealth.

Hence we have the spectacle of men like the Hon. Oakes Ames unblushingly casting their votes in our legislative bodies for measures which indirectly aggrandize themselves, and which have no other purpose. The interests of the commonwealth, duty to constituencies, official honor, all are forgotten in the mad scramble for wealth, and the power which wealth brings.

Is it to be wondered at, that in all this scramble and haste, men should frequently stumble and fall? Is it a wonder that confidence falters, and that men hesitate whom to trust? Is it a wonder that large monopolies are created; that the big fish eat the little ones, and that public and private morals deteriorate?

Did this affect only the personal interests of the men who thus seek to build their own fortunes at the expense of others, it would not be a matter of so great import, but when men like Oakes Ames fail, the industrial interests of the entire country suffer; credit is damaged, and general embarrassment is created.

We wish we could see a prospect of a more moderate ambition, and a return to the slower, but surer, paths to wealth in the immediate future; but in all the signs of the times we read no such pleasing augury. We must wait, therefore, till wisdom is obtained in the school of disastrous experience, and misfortune has cured the mania for rapid money-getting, now unfortunately so prevalent.

RAILROAD PROGRESS IN THE SOUTHERN STATES.

In no one particular has the South so materially advanced as in the construction of new railroad lines. Perhaps she has thus advanced more in what she proposes to do and is doing than in what she has done. With many navigable streams flowing through their land, and the slow character of business dealings previous to the war, the people of the South did not so much feel the necessity of well-conducted railroads as in these days of rapid transportation and quickly-made fortunes. Hence, many of the railroads built and existing in the South previous to 1861 were poor affairs, and in many instances more progress has been made in improving the old than in constructing new lines. Instances there are, too, of tracks torn up in the military operations of the war, which, like their owners, have been reconstructed, much to their present benefit and future durability.

In 1864 there were 8,944 miles of railroads in the Southern States proper. Of these 296 miles were built during the war, viz.: in North Carolina, 47 miles; Tennessee, 43 miles; Alabama, 62, and Texas, 144 miles. Up to 1871 there have been built 1,461 miles of railroad. These figures are according to "Poor's Railroad Manual," which, however, takes no note of the fact, that to build the forty-seven miles in North Carolina, another railroad was torn up by the Southerners. In Virginia there have been 104 miles of new railroad built. This work is chiefly on the Chesapeake and Ohio road and the road from Richmond to York River; also some on the Alexandria, Loudon, and Hampshire road. A great deal has been done in renewing and rebuilding old lines. The amount of this last character of work is particularly noticeable on the lines controlled by General Mahone, from Norfolk to Bristol, Tenn.

Of new roads, and roads in progress, the Chesapeake and Ohio, which has so slowly dragged its weary length along, commands first attention. It is intended to be a great through line for grain and other freight from the Ohio River to tide water at Richmond or below. It is being built as fast as the nature of the country will admit. The contract stipulates that it shall be finished in running order by January 1, 1872. The entire length is 427 miles.

Another line of great importance is one proposed to run the entire length of the famous Shenandoah Valley to Salem. It has been placed under contract, but will be built slowly, unless taken in hand by the Baltimore and Ohio Railroad Co., which line it would benefit. Another line much talked of, but hardly to be built, is an air line west from Norfolk to Bristol, Tenn., partly in North Carolina and partly in Virginia.

In North Carolina there have been built 146 miles of new railroad, being on the Western North Carolina, Wilmington, Charlotte and Rutherford, and Williamston and Tarboro roads. The first pierces the Blue Ridge, and is to open up the fertile and beautiful mountain section of the State. Of roads in progress, the extension of the Western North Carolina down the French Broad, thus to connect with the East Tennessee Railroad, has been graded. A portion has also been graded of the Western Division of the same road to run directly west to the Georgia line, and there to connect at Dalton, Ga. The Wilmington, Charlotte and Rutherford Railroad is slowly progressing from Wilmington to Charlotte. The Chatham road has been built from Raleigh southwards thirty-one miles, and is to be extended to South Carolina. The Fayetteville and Coalfields Railroad is chartered to extend to Salisbury, but there is no work being done on it, and but little, in fact, on any of these routes. Lines are proposed from and to various points, but none of them are likely to be built in the present condition of the State finances. But little of the track in this State was torn up during the war; but many bridges burned have been rebuilt, and a new one of great strength and handsome architecture constructed across the Cape Fear, at Wilmington.

In South Carolina 128 miles of road have been built, being the air-line from Columbia to Augusta, and part of the road from Augusta to Port Royal. This latter road is to be finished in 1871. The Blue Ridge road, intended to cross the southwestern end of North Carolina to Knoxville, Tenn., has not progressed any since the war. The contract was at one time let out, but afterwards abandoned.

In Georgia 232 miles have been built, being chiefly the Macon and Brunswick road, and the completion of the Selma, Rome, and Dalton, from the Alabama line to the latter point. In progress the Brunswick, Albany, and Eufaula road is most

prominent, as by its connection in Alabama, it is destined to form eventually a great freight line. Several small lines have been built within the past year, shortening the distance from Macon to Augusta. The Cartersville and Van Wert road, a short line, but one of much local importance, will be completed in a few months. The Atlantic and Gulf road also expects to run a branch north to Columbus during 1871. While Georgia can lay claim to having one of the best railroads in the South, she is disgraced, too, by, without doubt, the meanest. The Muscogee road is a shame to any people, and especially so to a corporation that is able to do better.

In Florida only 44 miles have been built, being the extension of the Florida Central from Lake City west. A number of roads are projected, and bonds appropriated to build them, but none are likely to be finished at present. A line is projected north and south through the State to some point on the mainland near Key West.

In Alabama the greatest progress has been made, there having been built 276 miles of road, and there is, at least, as much more in progress. The miles constructed are chiefly on roads in progress, the only completed line being the Selma and Montgomery. The Alabama and Chattanooga Company are rapidly completing their line. The North and South R. R., a line of much importance, is nearly completed. From Selma to Memphis the road is being rapidly built, as is also the Selma and Mobile. The Eufaula and Selma has been in great part graded, and some parts laid with iron. The Savannah and Memphis, from Opelika to Decatur, has been laid with iron about 30 miles, and is under contract the rest of the route. Many of these roads are intended to assist in developing the great mineral interests of the State. There have been some improvements in the old railroads of the State, not, however, so much as in Georgia, and in this respect the Selma, Rome, and Dalton is the only one which can lay any claim to being first-class.

In Mississippi 128 miles have been built, being a portion of the Selma and Memphis, and the New Orleans and Mobile; also a few miles of the Alabama and Chattanooga. The old railroads of the State have been somewhat improved, especially the N. O., Jackson, and Great Northern. The principal proposed railroad of this State is a continuation of the latter line from Canton to Decatur, Ala.

In Louisiana forty miles have been constructed, being chiefly the Southern Pacific line from Vicksburg to Shreveport. Several lines are proposed in this State, all looking to connection with Texas. The one just alluded to is being rapidly completed.

The Alabama and Chattanooga Co., are said to be endeavoring to control all avenues to the Southern Pacific R. R., by buying up old lines and building new. In this they have rivals from St. Louis and Memphis on the north and New Orleans on the south. One of their own lines, also, starts from New Orleans. The rivalry cannot but be of benefit to the people and the country.

In Tennessee 155 miles have been built, chiefly short branch lines or spasmodic efforts towards commencing great trunk lines, as the building of 30 or more miles on the Cincinnati, Cumberland Gap, and Charleston R. R., and a like number on the Blue Ridge, etc. All the railroads in which the State is interested are to be sold; they will undoubtedly fall into Northern hands and then be completed.

In Arkansas 90 miles have been built, being the line called Memphis, El Paso, and Pacific, from Memphis west. Another line from Memphis to St. Louis, running up the river in this State, is in progress. Lines are also in progress from St. Louis to the western part of the State and through the Indian Territory.

In Texas 132 miles have been built, being parts of various roads. The future of this State in the railroad line is certain to be great. The character of the country enables them to be built cheaply, the State grants public lands to them, and the fertile soil attracts emigrants, who demand this character of progress. The Southern Pacific skirts its northern border and a half dozen lines shoot up from the south to connect with it, while transversely, others are being constructed or planned.

Such is a brief sketch of the railroad progress of the South. That the next ten years will show a still greater progress, there is no doubt. A point of note in all these new lines is, that they are being completed with the latest improvements. Steel rails are not required, but the fish-bar joint and continuous rail tell of comfort, in the future, for those traveling South. The first completed line of road over which mails and passengers were carried, was in the South, yet since that she has lagged far behind. It is frequently thus that pioneers are outstripped in the race of progress by those who adopt their ideas, and there is every probability that we shall be able to show England the best railroad, as we have already the best locomotive. Thus, too, the South has had to learn from the North the perfection of steamship and railway transportation, both in freight and passengers, although she first inaugurated them in this country.

New Use of Dolomite.

We are all of us familiar with the lime light produced by the heat of the oxyhydrogen jet impinging upon a pencil of lime. It now appears that a prism cut out of the mineral dolomite will emit a light as powerful if not superior to the calcium light. The dolomite is made up of nearly equal parts of the carbonate of lime and magnesia, and the combination of these two earths produces effects superior to what can be obtained from either of them alone. The light is said to be suited for photographic purposes, especially for copying pictures. As dolomite is an abundant rock, its application for purposes of light may prove of peculiar value.

ON BLOOD AND ITS USES.

Blood is the liquid which circulates in the arteries and veins of animals. It is made up of colorless substances dissolved in water, and of red undissolved particles diffused through the liquid. It has a saline taste peculiar to the animal from which it is drawn, and modern microscopic research has shown that it is possible to distinguish not only the species of animal from which the blood is taken, but also from what function of the body it was derived.

When fresh drawn it rapidly coagulates into a gelatinous mass called clot, from which a pale yellow fluid separates known as serum. The clotting can be in a measure prevented by agitating the blood with a bundle of twigs or metallic rods. We do not propose to speak of blood in the animal economy, but of its employment in the arts.

SAUSAGES.

Blood has long been employed in some parts of Germany in the manufacture of sausages, known as blood sausages. The peasants stir it thoroughly, just as it is drawn, so as to prevent the formation of clot, and afterwards mix it with the hacked meat. The sausage is not particularly toothsome to strangers, but the natives take to it very kindly.

CLARIFYING SIRUP.

For the purpose of clarifying sugar-sirup blood has long been employed, but this has ever been, as it always must be, regarded as a repulsive method for the purification of an article of diet. The principle upon which it works is the coagulation of the blood by heat, thus carrying with it the coloring matter and impurities. Where albumen can be introduced as a substitute it is found to be preferable on many accounts. The nauseous and sickening odor that comes out of the purifiers when a new charge of blood is introduced, fills half the sugar refinery, and renders the place nearly uninhabitable for several hours. It is not to be wondered at, therefore, that persons engaged in the sugar trade have tried to find a less offensive substitute. For their use, and for analogous purposes, attempts have been made to manufacture albumen from blood with very encouraging results, as we shall see further on.

ARTIFICIAL WOOD.

Artificial wood has been for some time prepared in France by compressing sawdust and blood albumen at a suitable temperature into a solid mass, suitable for cabinet work, decoration for clocks, and interior ornamentation. It is claimed that this wood is more durable than the natural growth. Shavings and sawdust are ground to a powder, and mixed with blood sufficiently diluted with water, and dried at 106° to 120° Fah., in a suitable oven. The albumen of the blood thus becomes intimately incorporated with the sawdust, and the prepared wood in the form of fine powder is put into molds, where it is subjected to a powerful pressure with a hydraulic press. The plates of the press are heated with gas sufficiently to reduce the contents of the molds to a semi-fluid mass.

Resinous woods are found to combine better with the albumen than hard woods. The artificial wood can be cut and worked in the same manner as lumber, and as it is made chiefly of refuse material, the price in France is such as to render it available for many purposes. The ground wood, after being saturated with blood albumen, has the specific gravity of 0·800, but after having been subjected to the hydraulic press it is 1·300.

MANUFACTURE OF PRUSSIAN BLUE.

Attempts have been made to employ blood in the manufacture of ferro-cyanide of potassium. 150 pounds of well-dried blood were melted with 100 pounds potash, but it was found that no more than one sixth of the nitrogen was economized. The yield ought to have been 127·5 pounds, instead of which only 19·7 pounds were obtained. It would appear from this experiment that Prussian blue cannot be economically made from blood.

MANUFACTURE OF ALBUMEN FROM BLOOD.

In Pesth, Hungary, blood is dried in about twenty-four hours, at 100° to 112° Fah., in flat iron pans; and it has been found in practice that 110 pounds of albumen can be made from 3,000 pounds of blood. The best quality is clear, transparent, and soluble in cold water, and is used for mordanting goods. It costs in Pesth 60 florins for 110 pounds, whereas it would require 16,200 eggs to make 110 pounds albumen, the cost of which would be 200 florins. The egg albumen is more expensive, but is preferred for most purposes. The second quality of blood albumen is darker in color, but is nearly all of it soluble in water, and is used by sugar refiners. It can be kept any length of time without change, is effective in small quantities, and is quite uniform in its action, so that it can be used by sugar refiners with great economy.

A more complicated process for the manufacture of blood albumen is pursued in Northern Germany. The blood is caught in round zinc pans, three inches deep, and is put aside in a quiet place until it is coagulated. Only a small part of the serum separates on the top. The coagulated blood cake is cut into small cubes, and thrown upon seives or strainers, and the serum, mixed with blood corpuscles, flows off into pans provided with movable tubes, so that at the proper moment it can be drawn off without carrying the impurities with it that may have settled on the bottom. The serum obtained in this way is run into shallow porcelain dishes, and exposed to a current of air at 50° to 60° Fah., and is thus rapidly dried. It is indispensable to have the blood in thin layers to avoid its decomposition from moisture.

Richter finds that the blood of buffalo yields a whiter serum than that of other animals. It may be well in this connection to remark that albumen from fish has been made of good quality, and at a fair price.

Some varieties of blood albumen have been found on analysis to contain 53 to 55 per cent of soluble albumen, and in this state of purity it can be advantageously employed in

CALICO PRINTING.

In order to fix aniline colors, it is necessary to use albumen, and as these colors are now very popular, the consumption of eggs for furnishing the requisite quantity of albumen has become enormous, and the price of albumen is raised in proportion. We understand that the use of blood albumen by the calico printer is very large at the present time, and is constantly increasing; and that it can successfully compete with the egg albumen.

IN PHOTOGRAPHY.

Albumen paper has become very popular in photography, and some of our large manufacturers of photographic material use many gross of eggs in the preparation of the paper. If the blood albumen could be made sufficiently white and pure to be used as a substitute for the albumen of eggs, it would be a great boon to artists.

IN AGRICULTURE.

Blood is a powerful manure, and has long been used for this purpose. It is also employed in making cements, in mixing with coarse pigments for protecting walls from the action of the weather, in making animal charcoal, and as a coloring matter.

The above are some of the uses to which blood is applied in the arts.

Frendeet.

Sir S. W. Baker, the famous African explorer, states in his exploration of the Nile tributaries, that he was often called upon, in his capacity of physician, to treat diseases among the natives; but there was one complaint that baffled all his skill, and he was obliged to leave it entirely to the Arabs. It is caused by drinking water from table land pools. Frendeet commences with a swelling of one of the limbs, with intense pain; this is caused by a worm, several feet in length, but no thicker than a packthread. The Arab cure is to plaster the limb with cow dung, then prick the skin in many places with a red hot lance, to form doors, as they term them, for the escape of the worm. In about a week one of the wounds formed by the lance will inflame like a boil, and from it the head of the worm will issue, when it is seized and fastened to a small piece of wood, and gently wound daily, until, in the course of a week, the entire worm will be extracted, unless broken during the operation, in which case severe inflammation results.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—LEAKY CISTERNS.—What is the best method of stopping leaks in a wooden cistern? Is there any cement that will adhere to the wood, and which can be used for this purpose?—L. B.

2.—What is the best solder for aluminum? Is there not a better recipe than the following? Aluminum, 16 parts; tin, three parts bismuth, one part. This will do, but I wish to obtain a solder which will not change in the mouth when used for dental purposes.

3.—TURNING LATHE.—There is a lathe in the shop I work in, that no man in the shop can turn a true cylinder on, when the centers are straight. What is the trouble? I have worked on this lathe, and find that the centers being set straight, the cylinder will be one sixty fourth of an inch larger at the tail stock than at the cone. We get along by setting the tail stock over, as though we were going to turn a taper. What I wish to know is, why the lathe will not turn a true cylinder when the centers are straight, everything else about the lathe being in place? There are several machinists in the shop; all have tried to find the trouble and failed.—M C. B.

4.—GALVANIZING STEEL SPRINGS.—How can I galvanize steel springs without injuring the temper?—W. G. B.

5.—How can I fasten sheet copper to rough or smooth cast iron without rivets or bolts?—J. W. B.

6.—I wish a recipe for a leather cement, such as is used by belt manufacturers.—B. B. G.

7.—BROWNING GUN BARRELS.—Will some practical man tell me how the fine clouded brown on the fine double guns of the present day is produced, with full details of the process?—E. H. B.

8.—STEAM PUMP FOR HIGH PRESSURE ENGINE.—I am concerned in a steam tug. The cylinder is 16x16, and, as usual with small high-pressure engines, the pump, which is ample, is not the least troublesome item. Our first engineer inserted a waste pipe in the air chamber, and by means of a stop-cock let off, at each stroke, so much of the pumped water as he did not want in the boiler. The next man made use of the "sea cock" to throttle back so much of the water that the pump required as he did not want in the boiler. I object to both methods as unengineer-like, and propose to govern the quantity injected by making the stroke variable. Will your engineer correspondents please give an opinion on each of the modes, and say what way is generally adopted or considered best?—P. D.

9.—TOUGHENING BRITTLE HORN.—How can horn that has become brittle by age become tough again?—R. A. C.

10.—How can I tan or cure sheep's pelts with the wool on so that the skin may be soft and pliable, and the wool uninjured?—B. F. P.

11.—BRASS CHAIN.—How can I make a solder to braze brass wire rings? I want to make brass chain, and have the solder dip yellow, the same as the brass wire. I have tried silver solder, but that turns black on dipping in acid. I want the solder to melt at a low heat, that is, about the same as silver solder, cherry red.—G. H. H.

12.—BOILER FIRING.—How can I fire up my boiler so as to keep up seventy pounds pressure? The boiler is 8½ feet long and 42 inches in diameter. It is used for a tannery. I can run all my other machinery, but when I grind bark I cannot keep up pressure; must stop twice per hour to raise steam, even with all the other machinery detached. I commence grinding with seventy pounds and run down to sixteen pounds. The boiler is an upright one, and I use the best of wood for fuel when grinding. The smoke stack is red hot six feet above the boiler. The size of the engine is 8x24 inches. When running, every time I fire up I lose five pounds of steam. I feed hot water, and have a good draft, and would like to know if I could not [illegible] heat passing through the stack and use it for the boiler. The engine runs sixty-five revolutions per minute.—M. S. M.

NEW BOOKS AND PUBLICATIONS.

A Treatise on the Theory and Practice of Leveling; Showing its Application to purposes of Railway Engineering and the Construction of Roads, etc. By Frederick W. Simms, F.G.S., M. Instit. C. E., Civil Engineer. Fifth Edition. Revised and Corrected, with the Addition of Mr. Law's Practical Examples for Setting out Railway Curves. With Three Lithographic Plates and several Wood-cuts. New York: D. Van Nostrand, Publisher, No. 23 Murray street and 27 Warren street.

This being a new edition of a well-known valuable work it would be unnecessary here as well as impossible in our limited space to give it an extended review. It is enough to say to those who are not acquainted with the merits of the work, that it is one of the best treatises on the subject of leveling extant. The addition of the practical examples mentioned in the title will prove a great help to students, and even to those who have passed the student stage and have become engaged in the actual practice of engineering. The book is printed in fine bold type, is well bound, and presents a handsome appearance.

The Phrenological Journal and Packard's Monthly. A Repository of Science, Literature, and General Intelligence. Embellished with numerous Portraits from Life, and other Engravings. Vol. L., Old Series; Vol. I., New Series, January to June, 1870. S. R. Wells, Editor and Publisher, No. 389 Broadway, New York.

Mr. Wells will please accept our thanks for a handsomely bound volume of this popular publication.

The Technologist, for December, contains a fine table of contents. It closes the volume of this well-conducted and interesting monthly. It is issued by the Industrial Publication Company, 176 Broadway, New York, at the low price of $2·00 per annum.

We are in receipt, by the courtesy of the Hon. Horace Capron, U. S. Commissioner of Agriculture, of his Report for the year 1869. It is a voluminous and instructive document. Mr. Capron will please accept our thanks.

Business and Personal

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

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Grindstone Shafts, by J. E. Mitchell, Philadelphia, Pa.

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"How to use Grindstones," by J. E. Mitchell, Philadelphia, Pa.

At the Cincinnati Industrial Exposition, Oct., 1870, the judges say: "The Union Stone Company exhibit Emery Wheels and Grinding Stones which are composed of materials not affected by water, and that do not glaze in doing ordinary work, and do not produce a disagreeable smell when doing hard work. We consider them the best article of the kind on exhibition.

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Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

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Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

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Self-testing Steam Gage—Will tell you if it is tampered with, or out of order. The only reliable gage. Send for circular. E. H. Ashcroft, Boston, Mass.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. Brown and Barnes, Fair Haven, Conn.

Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

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For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

A very Valuable Patent for sale, the merits of which will be appreciated at sight. Apply to or address Jewell & Ehlen, 90 Liberty st., N.Y.

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Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

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Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

Filtering Water.—Your correspondent can make a cheap and good filter in his cistern by simply partitioning off one corner with one course in thickness of soft-burnt bricks, leaving a space inside of about 18x36 inches at the top of the cistern, making a close-fitting cover, through which to insert the pipe from the pump. The water will filter through the partition just about as fast as it comes into the outside cistern. F. A. H.

Cleaning Fire-engine Boilers.—I think the trouble with H. C.'s Cole steam fire-engine boiler would disappear by the attachment and use of a surface blow-off. I find it so not only with such engines, but locomotives.—T. L. V. D., of Neb.

Quarter Twist Belt.—If it would not be too presumptuous in a young mechanic, I will give to J. F. K., and others if they wish it, a rule for putting on a quarter twist belt to make it stretch alike on both edges, and do their work well, no matter what the width of the belt. The belt is to be put on in the usual way, and the ends brought together ready for lacing. Then turn one piece the opposite side (or inside) out, and lace. The belt will run, it will be found, first one side out, and then the other, and will draw alike on both sides.—W. H. K., of N. Y.

Quarter Twist Belt.—If Mr. J. F. K. will put up a short shaft parallel with, and running at the same speed as his driving shaft, with driving pulley the same size as the one in the driving shaft for quarter twist belt, and two pulleys on his driven shaft, and use two five-inch belts, he will find it much better than one wide belt.—W. S., of N. Y.

T. M. H., of Pa.—In the system of levers described in your query, if the power be constantly applied in a tangential line to the arc described, by the ends of the levers, the leverage will be the same on each lever; but if it be applied in the direction of either the chord or sine of the same arc the leverage will be greater on the longer lever. In estimating the power of levers, the direction in which the moving force is applied must never be disregarded.

T. H. R., of Kansas.—The holes broken out of the bottom of your lamp chimney admit air, which mixing with vapor from the oil used in your lamp forms an explosive compound, which, when sufficiently heated, makes the slight explosion described, and extinguishes the light.

C. H. R., of N. Y.—The electric light produced by the use of carbon points in connection with a galvanic battery is continuous. The flashes or sparks generated by friction in electric machines may also be made to succeed each other with such rapidity as to produce the effect of a continuous light, though, of course, only a succession of flashes in reality.

T. H. D., of ——.—All other things being equal, the longer the hose of a fire engine, the less will be the volume discharged, the less will be the velocity of discharge, and, as a matter of course, the less will be the throw. The diminution is wholly attributable to friction.

E. F. D., of Conn.—Very many recipes for black ink have been published in the Scientific American. You say you have found none that suits, but give no requirements, except that it shall be jet black at first, and always remain so. Arnold's Japan ink comes as near this requirement as any we know. We do not think the powder mentioned in your description of a new printer's ink, could be used to make a writing ink.

S. L. G. T., of N. H.—If we understand your query, the pipe nearest the ground would exact the least power for the supply of water to your city, for the two reasons, that being shorter it would have less friction, and the hight to which the water would be raised would also be less.

J. W. M., of N. Y.—There is no substance known that, placed between the poles of a magnet and its armature, will intercept the attracting power of the magnet.

W. H., of Wis.—The lubricating oil, called "West Virginia Black Oil," contains, we believe, some volatile hydrocarbons, which justify the discrimination made against it by the underwriters.

H. S. S., of Minn.—Rubber is not melted in the process of making overshoes as now conducted. The information you seek is hard to obtain, as the manufacturers refuse to disclose their processes.

S. A. R. and G. W. McK., of Ohio.—So far as we know, there has been no recent contest between English and American mowers and reapers.

H. E. S., of Kansas.—We know of no preparation that will remove hair from the human body without injury to the skin.

G. E. S., of Wis.—You should apply to some extensive dealer in paper hangings. Your query is not of sufficient general interest for publication.

A. L., of Texas.—Colored men have taken out patents, but as yet they, as a race, have not developed large inventive genius.

G. L. E., of Mass.—The tunnage of the *Great Eastern* is 27,000.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Cotton-seed Planter and Guano Distributer.—Henry L. Tillery, Halifax, N. C.—This invention relates to divers improvements in a machine intended for distributing guano in a drill, and then for planting cotton or other seed in the same drill, said improvements consisting of corrugated wings on the drum that sits within the seed-box, and of an arrangement of an A-shaped scraper, whereby the same may be made to cut furrows of greater or less depth; and of sundry other arrangements of said scraper and other devices.

"Target Game."—John C. Schooley, New York city.—This invention relates to a target through which is made a dozen, more or less, of holes, each hole being marked with a certain number; and in combination with the target a ball connected therewith by an elastic cord, the object of the game being to send the ball through one of the holes in the target by the recoil of the cord after it has been stretched.

Extension Plowshare.—George W. Thorp, Columbus, Kansas.—This invention has for its object to furnish an improved plow, which shall be so constructed and arranged that the share may be extended as it becomes worn and held securely in place when adjusted.

CORN PLANTER.—Fielding W. Poe, Jr., Vandalia, Ill.—This invention relates to certain improvements in corn planters, which appertain especially to the means whereby the seed-tubes are raised and lowered; and to the means whereby the seed-tubes are made to follow the inequalities of the ground; and to the means for insuring the "second drop."

SPARK ARRESTER.—Charles Pierpont, Durand, Wis.—This invention has for its object to furnish a simple and effective spark arrester for attachment to engine smoke-stacks.

FETTER OR CLOG FOR FOWLS.—Sanford J. Baker, Madison Center, Me.—This invention has for its object to furnish an improved fetter or clog for hens, turkeys, and other fowls, to prevent them from scratching in gardens, yards, fields, etc., which shall be simple in construction and effective in operation.

CORN PLANTER.—Joseph M. Whitmore and John N. Arvin, Valparaiso, Ind.—This invention has for its object to furnish an improved corn planter, which shall be simple in construction, easily operated, and effective in operation, and, at the same time, so constructed as not to be liable to get out of order.

SCREW-CUTTING DIES.—W. F. Cole, New York city.—This invention relates to improvements in screw-cutting dies with movable cutters, and has for its object to provide an arrangement, whereby the blocks may have the requisite strength and capacity, especially in the part for supporting the cutting ends of the cutters, with less metal used than heretofore.

RAILROAD CAR SPRING.—Albert Potts, Philadelphia, Pa.—This invention relates to a new manner of arranging, holding, and compressing the spiral springs for railroad cars, so that the same will be prevented from bulging out or bending when contracted, and increase in power of resistance with the weight.

FRAME FOR WHEELBARROW.—B. W. Tuthill, Oregon City, Oregon.—This invention relates to a new construction of metallic frames for wheelbarrows, and consists in making the two side bars or pieces of the frame together with the handles, all of one continuous piece of tubing. Great strength and simplicity of construction are thus obtained.

NAIL HEAD.—Thomas C. Richards, New York city.—This invention relates to a new arrangement of ornamental picture nail heads, with the object of facilitating the attachment of the same to the nails.

SEEDING MACHINE.—Jackson Cozad, Corydon, Iowa.—This invention relates to a new machine for scattering seed broadcast, and consists in the application and arrangement of a rotary basin, which serves by centrifugal force to throw the seed in all directions. The apparatus is applicable to all wheeled vehicles, and readily detachable when not required for use.

CAR-WHEEL MOLDS.—Wm. E. Worth, San Francisco, Cal.—This invention relates to improvements in rotary molds or flasks for utilizing the effect of centrifugal force to dispose the metal in casting car wheels. It consists in making the mold of a perforated disk of metal, and a ring fitted to it on which the chill ring rests, and the cope of a top plate and ring, all fitted together and to a disk on the top of a rotary shaft, for clamping together and to the disk, and the top and bottom plates are provided with ventilators.

CLOTHES PIN.—Geo. A. Harris, Buchanan, Mich.—This invention relates to improvements in clothes pins, and it consists in two pieces of wood or other substance, pivoted together at or near the center, and provided with an india-rubber spring between the pivot and one end, having a hole through it in the lengthwise direction of the said pieces, which are grooved, and the point is so formed that the clothes line may be passed through in the said direction, and the pieces will be clamped upon it at one end by the spring.

CLOTHES FRAME.—Henry M. Stevenson, South Peacham, Vt.—This invention relates to improvements in clothes-drying frames, and it consists in a frame composed of two side panels and two top panels, the side panels being jointed and braced, and connected to each other by jointed cross bars, the top panels being pivoted to the side panels at the top, one to each, and provided with pivoted braces for holding them in the oblique positions corresponding to the rafters of a house; all so arranged that the said dryer may be adjusted to one shape to stand in one position alone, or in other positions for leaning against a support, and may be folded together for stowing away.

REVERSIBLE PLOW.—G. W. Thompson, Ripley, Ohio.—This invention relates to improvements in reversible plows, and consists in making the double mold board of sheet metal in two parts, joined transversely at the center between the points where they are riveted to the oscillating brace connecting them with the plow beam. It also consists in an arrangement of the said brace calculated to prevent clogging.

SHOT CASE AND DISTRIBUTOR.—Sinclair Booton, Seguin, Texas.—This invention was fully illustrated and described in the last issue of the SCIENTIFIC AMERICAN.

DOUBLE HINGE.—John S. Jenness, Bangor, Me.—This invention relates to a new and useful improvement in hinges for hanging doors, more especially designed for trap doors, by means of which the door when open is made to rest flat upon the floor.

CLOTHES LINE HOLDER.—Ezra W. Talbott, Napoleon, Ohio.—This invention relates to a new and useful improvement in mode of raising, stretching, and holding clothes lines.

DROP-HAMMER LIFTER.—Francis M. Hodge, Shelburne Falls, Mass.—This invention relates to improvements in drop-hammer lifting apparatus, and consists in the application to the shaft of a drum, which lifts the hammer by winding up a belt attached to it, of an oscillating steam piston within a fixed case, and a tapped disk with lappets for shifting a steam valve for admitting the steam to the piston, and exhausting it; the object being to apply the steam directly to the shaft of the drum, so as to dispense with intermediate apparatus.

CALIPERS.—William P. Hopkins, Lawrence, Mass.—This invention relates to improvement in calipers, and in the adjusting nuts therefor, and consists in arranging the adjusting nut and screw (or screw only, when used without a nut) for spreading the legs apart, and to serve as a stop when they are forced together, and in arranging the spring to force the legs together, the object being to provide calipers which may be used for taking the gage of plates, disks, and the like, which are thicker at the rims than inside the same, by opening the legs to pass over the thick place, and adjusting the nut or screw to the right point, then opening the calipers to disengage them from the plate, after which the spring will close them down to the nut again, in the same position as before.

PAINT BRUSH.—William B. Burtnett, New York city.—This invention relates to improvements in the construction of paint brushes, and it consists in improvements in the construction of the conical plug by which the bristles are wedged into the ferrule, and the handle is secured in the ferrule, to facilitate the application of the plug and the tightening of the bristles. It also consists in the arrangement of the handle and the plug relatively thereto to facilitate tightening up the bristles in case they become loose by the age of the plug.

COMBINED GUIDE FOR SEWING MACHINES.—William H. White, Baltimore, Md.—The object of this invention is to combine in one simple, practicable instrument, devices which will fold, hem, and bind in many different ways, each of which has heretofore required a different guide, and to adapt such instrument at the same time to the manufacture of French folds, in two, three, or more parts.

SAW SET.—H. A Harris, Center, Texas.—This invention has for its object to furnish an improved saw set for setting the teeth of circular and other saws, which shall be simple in construction, convenient in use, and effective in operation, enabling the teeth to be all set at the same pitch and at any desired pitch.

SAWING MACHINE.—W. A. Allen, Baltimore, Md.—This invention relates to improvements in machines for splitting kindling wood, and it consists in a combination with a fixed feeding spout, of a pair of reciprocating splitting blades and a holding and discharging plate, in a manner to split the block into slabs, and the slabs into small pieces, and discharge the same after being split, in a simple and efficient manner. It also consists in an arrangement with the hopper of a gate for preventing the discharge of the wood in case the feeding is stopped while the machine continues to run.

ADJUSTABLE COFFEE AND TEAPOT STRAINER.—G. A. Barron, Pembroke, Maine.—This invention relates to a new and useful improvement in strainers for coffee and teapots, and consists in a cylinder, open at each end, composed in whole or in part of perforated metal or wire gauze, and constructed so as to be varied in diameter to fit tea and coffee pots of different sizes.

CHURN DASHER.—Robert Brown, Columbus, Miss.—This invention relates to improvements in churn dashers, and consists in a wide ring of metal with two sets of oblique bars traversing the space within the ring in a way to be very efficient in agitating the cream.

MANUFACTURE OF PILLS.—Pierre Cauhaepe, New York city.—This invention relates to improvements in the manufacture of pills, and it consists in the employment, either in combination with a molding device for shaping the pills or other holder for them, of a comb bar with pins or needles adapted for inserting a pin in each mold cavity for taking the pills and dipping them in the coating solution, and a clamp and stripper for taking them from the needles and redipping them for filling and covering the cavities formed by the pins.

BASIN COCK.—C. A. Newton, Providence, R. I.—This invention relates to improvements in wash-basin cocks, designed for drawing hot or cold water from one cock, and consists in a combination with a vertical tube having two independent passages and adapted for attachment to the table in which the basin is placed, and a nozzle fitted to it to cut off one passage, while allowing the water to discharge from the other, of a branch attachment and packing therefor of peculiar construction for the attachment of the hot and cold water pipes.

MOTIVE POWER.—C. A. Mills, Bridgeport, Conn.—This invention relates to improvements in motive power, and it consists in a combination with a wheel having buckets, and mounted to work in a vertical plane, of a couple of chambers for holding and delivering sand, shot, or other like matters to be used to apply the power by flowing upon the wheel, said chambers being supported on opposite sides of the wheel by a case disclosing the wheel and serving to conduct the flowing matter from the wheel into the chambers, which case may be turned by hand or other means to shift the loaded chamber from below to the top, and the empty one from top to bottom, when the flowing matter has run through.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

PROVISIONAL PROTECTION FOR SIX MONTHS.

SEWING MACHINE.—David Whittemore, Boston, Mass. December 3, 1870.

AXLES AND AXLE-BOXES FOR WHEELED VEHICLES.—Ernest Von Jeinsen and James Monroe McDonald, San Francisco, Cal. December 2, 1870.

SPRINGS CHIEFLY DESIGNED FOR RAILWAY AND OTHER CARRIAGES.—P. Sarsfield Devlan, Jersey City, N. J., and Isaac Pennington Wendell and S. P. M. Tasker, Philadelphia, Pa. December 15, 1870.

LIFE-PRESERVING CLOTHING.—Clark Spencer Merriman, Valesca, Iowa. December 8, 1870.

MACHINERY FOR CUTTING LOAF SUGAR.—George Henry Moller, New York city. December 1, 1870.

WIRE BANDS FOR FASTENING BALES.—Edwin Sewall Lenox, New York city. December 13, 1870.

ELECTRIC BRAKE FOR RAILWAYS.—Joseph Olmstead, Chicago, Ill. December 13, 1870.

PROCESS OF ELIMINATING THE COLORING MATTER OF GARANCINE AND OTHER PRODUCTS OF MADDER.—Spencer Borden, Fall River, Mass. December 15, 1870.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING JAN. 3, 1871.

Reported Officially for the Scientific American.

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110,617.—FLIER FOR SPINNING MACHINE.—T. T. Abbott and John A. V. Smith, Manchester, N. H.
110,618.—MOLE TRAP.—John Adams, Greencastle, Ind.
110,619.—STONE DRAG.—Elijah C. Allen, Deerfield, Mass. Antedated Dec. 21, 1870.
110,620.—SEEDING MACHINE.—Asher S. Babbit (assignor to Babbit, Hinckley & Co.), Keesville, N. Y. Antedated December 29, 1870.
110,621.—FETTER OR CLOG FOR FOWLS.—Sanford J. Baker, Madison Centre, Me.
110,622.—PUMP.—Joel R. Bassett, Cincinnati, Ohio.
110,623.—MACHINE FOR MARKING SQUARES.—Charles S. Bement, Southington, assignor to Hart Manufacturing Co., Kensington, Conn.
110,624.—CUTTER FOR NAIL-CUTTING MACHINES.—Eleazar Bless, Indianapolis, Ind.
110,625.—SHOT-CASE AND DISTRIBUTER.—Sinclair Booton, Seguin, Texas.
110,626.—COMPOUND FOR CULINARY USE.—Henry W. Bradley, Binghamton, N. Y.
110,627.—RENDERING AND TREATING OFFAL AND OTHER ANIMAL SUBSTANCES.—Duncan Bruce (assignor to Emma Bruce), Brooklyn, N. Y.
110,628.—PAINT BRUSH.—William B. Burnett, New York city.
110,629.—HOG SNOUTER.—John C. Campbell and Warren S. Bruce, Good Hope, Ill. Antedated December 30, 1870.
110,630.—PILL MACHINE.—Pierre Cauhape, New York city.
110,631.—PAPER-CUTTING MACHINE.—John E. Coffin (assignor to F. W. Bailey and James Noyes), Portland, Me.
110,632.—BEDSTEAD FASTENING.—Charles S. Comins, Lowell, Mass.
110,633.—FASTENING FOR EAVES TROUGHS.—Leonard Cook, Shreveport, La.
110,634.—SEEDING MACHINE.—Jackson Cozad, Corydon, Iowa.
110,635.—FLOUR BOLT.—Robert W. Cunningham, Chesterville, Ohio.
110,636.—COTTON PLANTER AND MANURE DISTRIBUTER.—N. Donaldson, Line Creek, S. C.
110,637.—REVERSIBLE LATCH.—Heinrich Dotzenroth, Pittsburgh, Pa.
110,638.—REFINING PETROLEUM.—Richard Eaton, Montreal, Canada.
110,639.—PROTECTING THE HEARTHS OF FURNACES.—H. W. Ellicott, Baltimore, Md.
110,640.—LOOM.—Robert Elliott, Chester, Pa.
110,641.—VENTILATOR.—William Ennis, Philadelphia, Pa.
110,642.—DOVETAILING MACHINE.—Harry E. Evarts, Chicago, Ill.
110,643.—ALARM FOR LOCOMOTIVE ENGINES.—R. A. Filkins, North Adams, Mass.
110,644.—COMBINED COTTON-SEED PLANTER AND GUANO DISTRIBUTER.—Lafayette Gantt, Camilla, Ga.
110,645.—GLASS TELEGRAPH INSULATOR.—John Garity, East Birmingham, Pa.
110,646.—GATE.—Robert Gidley, Lagrangeville, N. Y.
110,647.—HAND-HOLE CAP FOR STEAM BOILERS.—Wm. W. Graham, Boston, Mass., assignor to himself and J. S. Parsons, Windham Conn.
110,648.—LAMP.—Franklin T. Grimes, Liberty, Mo.
110,649.—CLOTHES PIN.—George Alfred Harris, Buchanan, Mich.
110,650.—SAW SET.—Henry A. Harris, Center, Texas. Antedated December 28, 1870.
110,651.—FOLDING LAMP SHADES.—Henry M. Hartshorn, Malden, Mass. Antedated December 30, 1870.
110,652.—COMPOSITION FOR PRESERVING WOOD.—William Hayman (assignor to himself and William R. Black), Taunton, Mass.
110,653.—RECLINING AND ROCKING CHAIR.—Samuel Hayward, Boston, assignor to himself and Luther E. Kimball, Cambridgeport, Mass.
110,654.—BASE-BURNING FIRE-PLACE HEATER.—E. S. Heath Baltimore, Md.
110,655.—DROP-HAMMER LIFTER.—Francis M. Hodge, Shelburne Falls, Mass. Antedated December 24, 1870.
110,656.—KNITTING MACHINE.—Wm. H. Hollen, Fostoria Pa.
110,657.—CALIPER.—William P. Hopkins, Lawrence, Mass.
110,658.—THRASHING MACHINE.—Hiram E. Hurlburt, Hammondsport, N. Y. Antedated December 20, 1870.
110,659.—DOUBLE HINGE.—John S. Jenness, Bangor, Me.
110,660.—SUBSOIL PLOW.—Marquis R. Jones, Walworth, Wis. Antedated December 31, 1870.
110,661.—MILKING STOOL.—Richard W. Jones and John B Baker, Syracuse, N. Y.
110,662.—APPARATUS FOR THE MANUFACTURE OF BROMINE.—John J. Juhler, Natrona, Pa.
110,663.—RUT LEVELER.—Calvin Marshall, North Easton, Mass.
110,664.—HOT-AIR FURNACE.—Peter Martin, Cincinnati, Ohio.
110,665.—COMPOSITION FOR ROOFING.—J. B. Melvin, Lowell, Mass.
110,666.—PURIFICATION OF CAST IRON.—J. W. Middleton, Philadelphia, Pa. Antedated December 22, 1870.
110,667.—MOTIVE-POWER APPARATUS.—C. A. Mills, Bridgeport, Conn.
110,668.—HOT-WATER FEEDER FOR STEAM BOILERS.—J. H. Mills, Boston, and John Howarth, Salem, Mass.
110,669.—SEWING MACHINE FOR WORKING BUTTON HOLES.—Eugene Moreau, San Francisco, Cal., assignor to himself, J. W. Haggerty, and Samuel Hill.
110,670.—TUCKING DEVICE FOR SEWING MACHINES.—Aaron Morehouse, Hartford, Conn.
110,671.—SAW TABLE.—Peter Neeb, Buffalo, N. Y., assignor, by mesne-assignment, to Margaret Neeb.
110,672.—FLOUR SIFTER.—Lucy Sawyer, Templeton, Mass. Antedated December 17, 1870.
110,673.—WAGON BRAKE.—Andrew Van Der Hyden Oliver Bethlehem, N. Y.
110,674.—BELT SHIPPER.—J. L. Otis, Leeds, Mass.
110,675.—PRINTING TELEGRAPH.—G. M. Phelps, Brooklyn, N. Y., assignor to the Western Union Telegraph Company, New York city.
110,676.—SPARK ARRESTER.—C. L. Pierpont, Durand, Wis.
110,677.—LUBRICATOR.—William Pratt, Providence, R. I. and N. B. Williams, New York city, assignors to A. A. Williams, Brooklyn, N. Y.
110,678.—CHURN.—J. H. Reed, La Fayette, Ind.
110,679.—CORN PLANTER.—John Reichelderfer, Cridersville Ohio, administrator of Philip Kuntz, deceased.
110,680.—MANUFACTURE OF ACID PHOSPHATES FOR USE IN BAKING POWDERS, ETC.—N. B. Rice, East Saginaw, Mich.
110,681.—STEAM ENGINE.—Thomas Ross, Rutland, Vt.
110,682.—CULTIVATOR.—Jacob Sattison, Ripley Township Ohio.
110,683.—WINDMILL.—Edvard Savoral, New York city. Antedated December 31, 1870.
110,684.—CASTING BAR SOLDER.—Abraham Schoenberg, New York city.
110,685.—DIES FOR FORMING HORSE-COLLAR SHELLS.—J. W. Schwaner, Egg Harbor City, N. J.
110,686.—SHUTTER FASTENING.—P. T. Share, Baltimore, Md
110,687.—GATE.—G. A. Slater, Benton Harbor, Mich. Antedated December 30, 1870.
110,688.—SEED DROPPER.—H. M. Smith, Richmond, Va.
110,689.—PATTERN FOR MOLDING STOVE LIDS.—Samuel Smith (assignor to himself and Charles Noble & Co.), Philadelphia, Pa.
110,690.—LUBRICATING COMPOUND.—J. H. Smyser, Pittsburgh, Pa.
110,691.—CLOTHES DRYER.—H. M. Stevenson, South Peacham, Vt.
110,692.—REVERSIBLE PLOWS.—G. W. Thompson, Ripley, Ohio.
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110,697.—FOLDING BEDSTEAD.—Joshua Turner (assignor to B. A. Pettingill and I. S. Pear), Cambridgeport, Mass.
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110,704.—CONSTRUCTING MOLDINGS OF PAPER.—W. W. Webster, Chelsea, Mass.
110,705.—SAW.—Thomas Welham, Philadelphia, Pa. Antedated December 17, 1870.
110,706.—SEED PLANTER.—W. F. West, Haverstraw, N. Y.
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110,747.—DOOR FOR RANGES.—Royal E. Deane and Thomas Shedd, New York city.
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110,785.—STEP LADDER.—William G. Philips, Newport, Del.
110,786.—CORN PLANTER.—Fielding W. Poe, Jr., Vandalia, Ill.
110,787.—WINDOW SHADE.—Ansel W. Porter, Union City, Ind.
110,788.—CORN PLANTER.—Jacob R. Randall, Camargo, Ill.
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110,799.—MOWING MACHINE.—Zuriel Swope, Lancaster, Pa.
110,800.—APPARATUS AND PROCESS OF CLEANING COTTON WASTE, ETC.—George W. Sylvester, Belleville, N.J.
110,801.—MEAT CHOPPER AND VEGETABLE SLICER.—James M. Taft, Arcadia, Wis.
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110,804.—SODA WATER FOUNTAIN.—Antony Tumler, New York city.
110,805.—SCHOOL DESK AND CHAIR.—Alexander Sidney Vaughan, Elkton, Md.
110,806.—APPARATUS AND PROCESS FOR DISTILLING OIL.—William G. Warden, Philadelphia, Pa.
110,807.—COTTON PLANTER.—Dwight F. Welsh, Nevada, Ohio.
110,808.—RAILWAY SWITCH.—William Wharton, Jr., Philadelphia, Pa.
110,809.—BEE HIVE.—John Wheeldon, Greensburg, Ind.
110,810.—ATTACHMENT FOR SEWING MACHINE.—William H. White (assignor of one half his right to I. Wellington Hoyer), Baltimore, Md.
110,811.—CORN PLANTER.—Joseph M. Whitmore and John N. Arvin, Valparaiso, Ind.
110,812.—MACHINE FOR WRAPPING "KISSES," ETC.—Charles C. Wilson, Baltimore, Md.
110,813.—CUT-OFF VALVE FOR STEAM ENGINES.—George S. Young (assignor to himself and Al Fitch Boynton), Clearfield, Pa.
110,814.—MILL-SPINDLE STEP.—George S. Young (assignor to himself and Al Fitch Boynton), Clearfield, Pa.

REISSUES.

4,223.—CHILDREN'S CARRIAGE.—William E. Crandall, New York city. Patent No. 100,121, dated Feb. 22, 1870; reissue No. 3,972, dated May 17, 1870.
4,224.—SECURING RAILWAY-RAIL JOINT.—Lyman Fay, Worcester, Mass., assignor to Joseph M. Rice, same place, and Daniel R. Pratt, New York. Patent No. 35,597, dated June 17, 1862.
4,225.—Division A.—INSTRUMENT FOR DRAFTING GARMENTS.—Ursula Louise Leete, New Haven, Conn. Patent No. 107,068, dated Sept. 6, 1870.
4,226.—Division B.—INSTRUMENT FOR DRAFTING GARMENTS.—Ursula Louise Leete, New Haven, Conn. Patent No. 107,068, dated Sept. 6, 1870.
4,227.—CLOTHES WASHER.—Ariadna B. Mercier, Providence, R.I. Patent No. 56,773, dated July 31, 1870.
4,228.—PUNCH.—Isaac P. Richards, Whitinsville, Mass. Patent No. 104,769, dated June 28, 1870.
4,229.—BLANK FOR AND DIE FOR MAKING MOLD BOARDS FOR PLOWS.—William Medd Watson, Tonica, Ill. Patent No. 109,225, dated March 15, 1870.

DESIGNS.

4,547 to 4,550.—CARPET PATTERN.—Robert R. Campbell (assignor to Lowell Manufacturing Company), Lowell, Mass. Four Patents.
4,551.—HAIR PIN.—William F. Fluhrer, New York city.
4,552 and 4,553.—TYPE.—Julius Herriet (assignor to David Wolf Bruce), New York city. Two Patents.
4,554.—EGG STEAMER.—William Kirkham, Springfield, Mass.
4,555.—SHAWL.—Charles H. Landenberger, Philadelphia, Pa.
4,556.—RAILING FOR CEMETERY LOTS.—Albert Laurence Murphy, Philadelphia, Pa.
4,557.—LAND MARK.—John H. Parrish, Greensborough, Ala.
4,558.—COLLAR-BOX COVER.—Pulaski B. Pickens, New York city.
4,559 to 4,561.—TYPE.—Richard Smith (assignor to MacKellar, Smiths & Jordan), Philadelphia, Pa. Three Patents.
4,562.—CHAIN HOOK.—George D. Stevens, New York city.

TRADE MARKS.

122.—DURHAM TOBACCO.—W. T. Blackwell, Durham, N. C.
123.—AGRICULTURAL IMPLEMENT.—Hall & Speer, Pittsburgh, Pa.
124.—HAY ELEVATOR AND OTHER AGRICULTURAL IMPLEMENTS.—Aaron J. Nellis, Pittsburgh, Pa.
125.—SEA MOSS COUGH CANDY, TROCHES, AND SIRUP.—William J. Rand, Jr., Brooklyn, N.Y.
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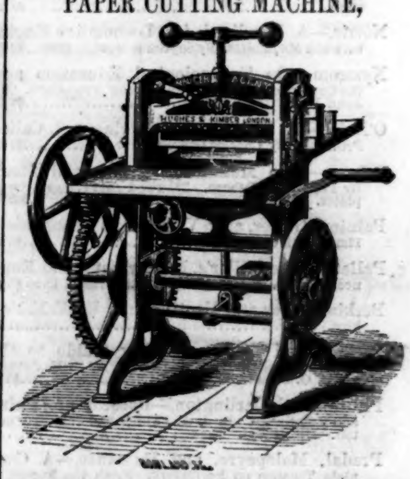

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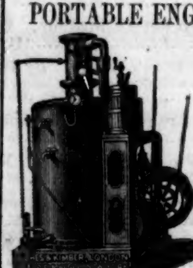

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